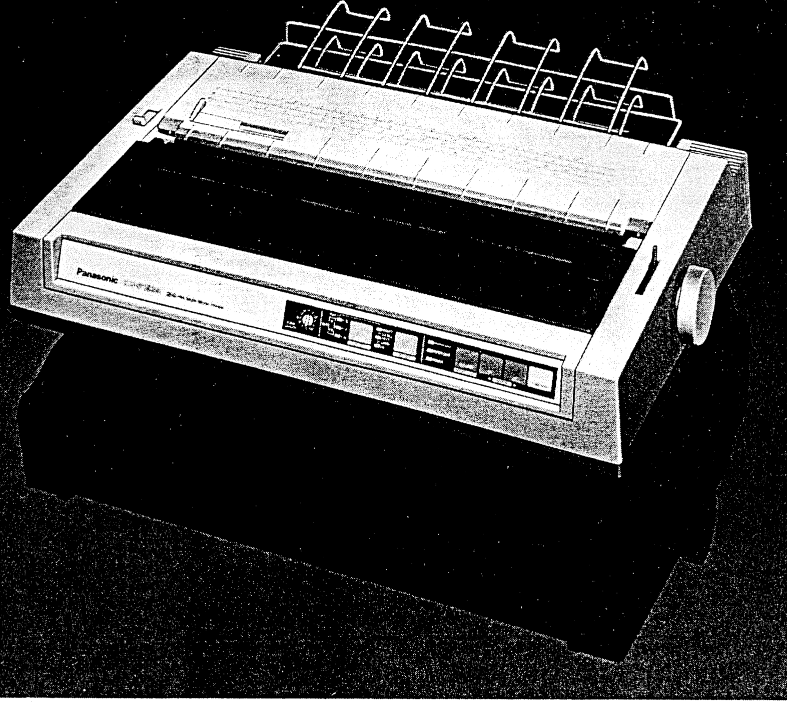
Operating Instructions

Impact Dot Matrix Printer

KX-P1524



Panasonic

Before operating this unit, please read these instructions completely.

This equipment has been tested and found to comply with the limits for a Class B computing device in accordance with the specifications set forth in Subpart J of Part 15 of the FCC Rules. If this equipment does cause interference to radio or television reception which can be determined by turning the equipment on and off, use the equipment in another location and/or utilize an electrical outlet different from that used by the receiver. When using special accessories such as cables, the user should use accessories recommended in these operating instructions or supplied by the manufacturer to comply with the limits for a Class B computing device pursuant to Subpart J of Part 15 of FCC Rules.

WARNING: TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS PRODUCT TO RAIN OR ANY TYPE OF MOISTURE.

The serial number of the unit may be found on the label on the rear of the unit. For your convenience, note this number below, and retain this book, along with your proof of purchase, to serve as a permanent record of your purchase in the event of a theft, or for future reference.

MODEL NO. KX-P1524 ____________ NAME OF DEALER ____________

SERIAL NO. ____________ DATE OF PURCHASE ____________

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1. Introduction

1.1 Product Overview

This printer is a high quality impact dot matrix printer designed for use with a wide variety of computers in a business environment. This printer can also be used to provide a printout from computer terminals connected to a network.

This printer is rated at 240 characters per second (cps) and can print bi-directionally, i.e., left-to-right and right-to-left. As standard, the printer has three basic print fonts—Draft, Text and Letter Quality. Additionally, external Letter Quality fonts are available by using optional font cards. It also has 5 character pitch selections. They are 10, 12, 15 & 17 characters per inch (cpi) and proportional spacing (ps). These modes can be selected by front panel switches or through software commands. This printer also has a graphics mode. In this mode the user can create charts, graphs or other illustrations.

This printer uses a 24 pin print head to form a 24×9 dot matrix character in draft and text modes. In letter quality mode, the matrix is 24×30. The standard character set consists of 96 ASCII characters which can be printed in conventional font or in italics. You can also select 11 international character sets.

Tractor feed and friction feed are both standard on this printer. This allows the printer to accommodate both fanfold and single sheet paper as well as envelopes. The unidirectional tractor option allows paper to be fed from beneath the printer.

Also, the printer uses "push" tractors. Therefore, continuous forms can be torn off without the need to skip a form when advancing to the next one. The printer also has a forms length selector on the front panel. The user can select the length of the form between 3" (76 mm) and 14" (356 mm). This is very useful when printing on non-standard paper sizes such as mailing labels.

The printer head life is designed for 200 million dots per pin. The seamless fabric ribbon has an operating life of 3 million characters. The ribbon cassette design makes changing the ribbon easy and clean.

This printer has both Centronics parallel and RS-232-C serial interface as standard. The RS-232-C interface supports the XON/XOFF and DTR handshaking protocols at baud rates up to 9600 bps. The printer also comes equipped with an internal standard 13.5K buffer. An additional 32K buffer is available as an option. This expands the total buffer size to 45.5K. With this option the buffer or a portion of it can be used as a receiving buffer or a portion of it can be used as a download font area. The buffer area assignment is selected by DIP switches.

For software compatibility, this printer has three command sets—Epson LQ-1500™, IBM Proprinter™ and Diablo® 630. Each set can be selected by setting corresponding printer mode with DIP switch 1-1 and 1-2. Refer to DIP switch section in this manual.

1.2 Specifications

Power requirements: AC 120 V (60 Hz)
Current: 4 A
Interface: Centronics parallel and RS-232-C serial
Print fonts: Draft, Text, Letter Quality (Courier)
Software Emulation: Epson LQ-1500, IBM Proprinter, Diablo 630
Character sets: 96 ASCII characters, 96 Italic ASCII characters, 32 International characters (11 countries), 32 Italic International characters (11 countries), 135 IBM special characters
Dot configuration: 1/127 inch (0.2 mm) dot diameter

	Draft (PICA)	Text (PICA)	LQ
Dot alignment (Ver.×Hor.)	24×9	24×9	24×30
Dot pitch (Hor.)	1/120" (0.21 mm)	1/120" (0.21 mm)	1/360" (0.07 mm)
(Ver.)	1/180" (0.14 mm)	1/180" (0.14 mm)	1/180" (0.14 mm)

Character size: Ordinary characters: 0.074 (W)×0.097 (H) in. (1.89×2.46 mm)

Number of characters per line:

Pica (Draft, LQ) (10 cpi)	136
Elite (Draft, LQ) (12 cpi)	163
Micron (Draft, LQ) (15 cpi)	204
Compressed (Draft, LQ) (17 cpi)	233
Pica elongated (5 cpi)	68
Elite elongated (6 cpi)	81
Mikron elongated (7.5 cpi)	102
Compressed elongated (8.5 cpi)	116

Printing speed:

Draft High Speed (12 cpi)	240 cps
Text High Speed (12 cpi)	160 cps
LQ High Speed (12 cpi)	80 cps
Normal Draft (10, 12, 15 cpi/17 cpi)	200/172 cps
Normal Text (10, 12, 15 cpi/17 cpi)	133/115 cps
Normal LQ (10, 12, 15, 17 cpi)	67 cps

Printing direction:

Text printing	Bi-directional
Bit image printing	Uni-direction (left to right)

New line time: Approx. 100 msec [with 1/6 inch (4.2 mm) line feeding]
Paper feed: Tractor feed (with fanfold paper)
Friction feed (with single sheet)
Paper used: Fanfold paper: Width: 4~15.5 inches (102~394 mm)
Thickness: (paper weight in pound): 16~20 pounds
Single sheet: Width: 4~16.5 inches (102~419 mm)
Height: 5~14.3 inches (127~363 mm)
Thickness: (paper weight in pound): 14~24 pounds (1 sheet)
Envelopes: Standard business envelope ie: #10 size
Copies: Original and 3 non carbon copies
Operating environment: 50°F (10°C) to 95°F (35°C) temperature, 20~80% humidity (please allow printer to stabilize at room temperature within the operating temperature range before operation)
Storage environment: −4°F (−20°C) to 140°F (60°C) temperature, 10~90% humidity
Head service life: 200 million dots per pin
Ribbon: Cassette seamless fabric ribbon
Service life: Approx. 3 million characters in draft mode
Dimensions: 24 (W)×15.4 (D)×6.1 (H) in. (610×390×155 mm)
Weight: Approx. 34.8 lbs. (15.8 kg)

2. Set up

2.1 Unpacking and Inspection

Carefully open the shipping carton and remove the contents. Table 2.1 shows the items that the carton should contain. Inspect the printer and accessories for damage. Report damage or shortages to the store from which the unit was purchased. Inside the front cover is an area for recording important information regarding the printer.
To prevent possible damage, please keep all packing materials in the event that transportation is required in the future.

Printer
Ribbon Cassette (1)
Paper Separator (1)
Operating Instructions Manual

Table 2.1 Carton Contents

2.2 Names of the Parts

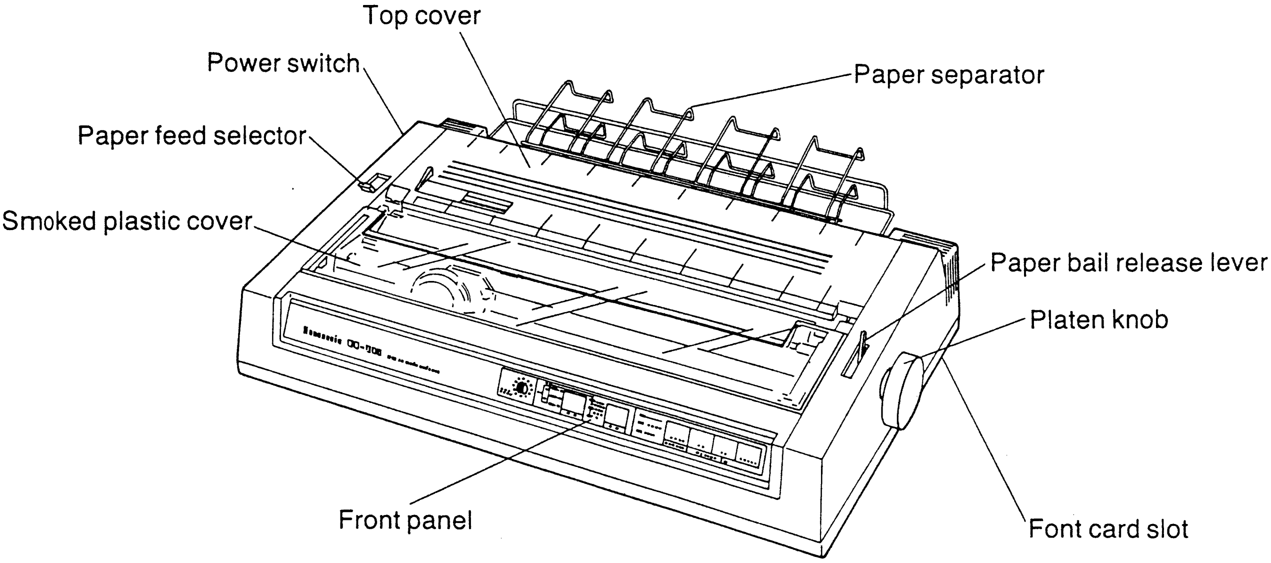

Top cover
Power switch
Paper feed selector
Smoked plastic cover
Paper separator
Paper bail release lever
Platen knob
Front panel
Font card slot

Figure 2.1 Names of the Parts

2.3 Initial Setup

Site Requirements

This printer can be installed in any normal office environment. No special wiring or cooling is required. However, a minimum of 4″ (10 cm) clearance on all sides is necessary to insure proper ventilation. The printer should be placed on a flat horizontal surface away from a heater or other heat source. The printer should not be used in an excessively humid or dusty environment. Table 2.2 lists the operating requirements of the printer.

Line Voltage	AC 120 V
Frequency	60 Hz
Temperature	50~95°F (10~35°C)
Humidity	20~80%

Table 2.2 Installation Requirements

Removing the printer covers

- To remove the top cover and the smoked plastic cover, lift them in the directions shown in Figure 2.2.

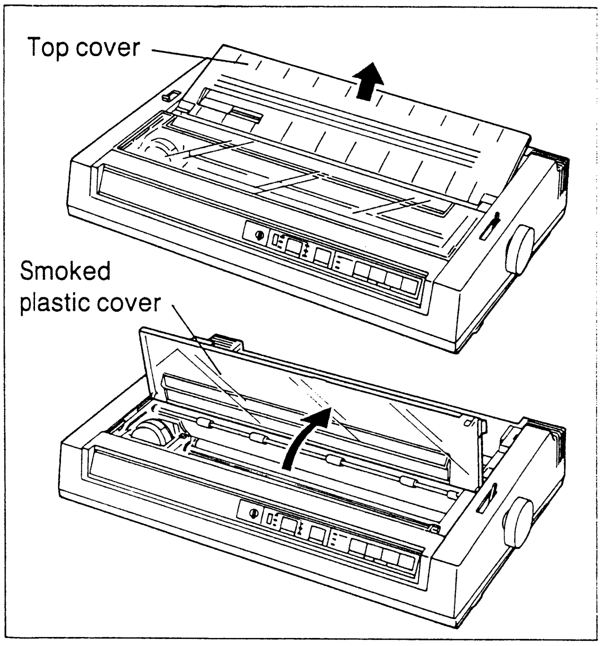


Figure 2.2 Removing the Printer Covers

- Remove the protective paper around the platen.

Removing the carriage stopper

To prevent damage to the print head during transit, the carriage is held in place by a carriage stopper. This stopper must be removed prior to operating the unit. Figure 2.3 shows the location of the stopper. Be sure to replace it before transporting the printer.

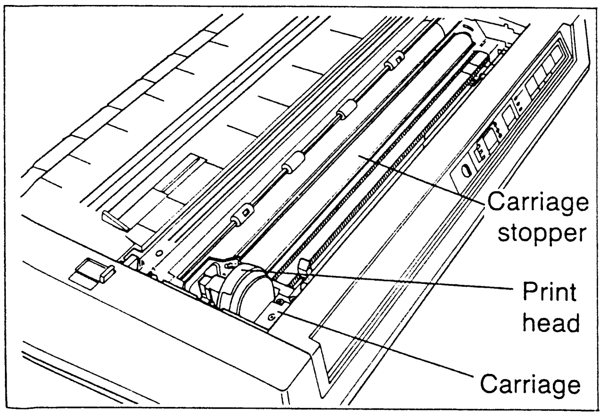


Figure 2.3 Removing the Carriage Stopper

Mounting the ribbon cassette

- Refer to Figure 2.4A. Make sure the printer is off. Gently slide the print head carriage toward left of the unit. Position the carriage between two ribs.

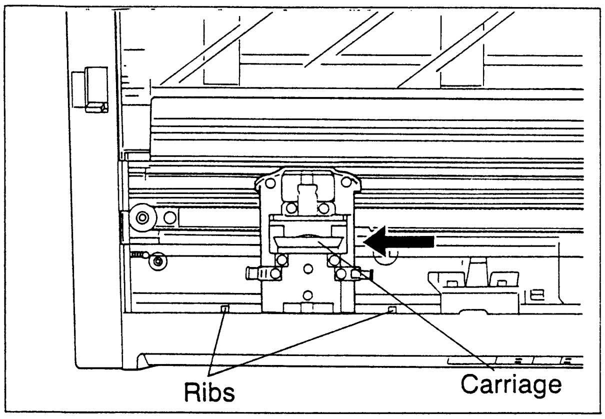

Ribs
Carriage

Figure 2.4A Positioning the Carriage

- Prior to installing the cassette, remove any slack in the ribbon by rotating the knob on the cassette counterclockwise. Refer to Figure 2.4B.

  Note: Do not remove the ribbon mask (transparent sheet).

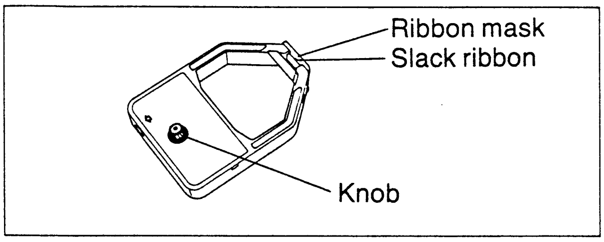

Ribbon mask
Slack ribbon
Knob

Figure 2.4B Removing the Ribbon Slack

- Position the cassette over the carriage and lower it in place, inserting its rear end first as shown in Figure 2.4C. Visually insure that the ribbon slips between the nose cover and the nose of the print head. Gently, but firmly press down on the cassette until the two wing tabs snap into place.

- To remove the cassette, gently spread the wing tabs and lift up the cassette.

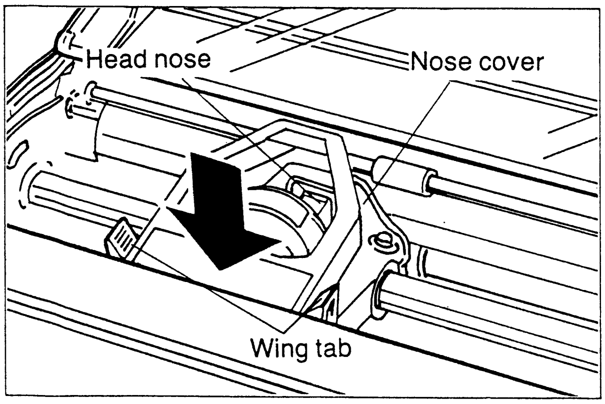

Head nose
Nose cover
Wing tab

Figure 2.4C Installing the Ribbon Cassette

Mounting the paper separator

The paper separator insures the smooth flow of fanfold paper. Figure 2.5 shows how to install the separator. Install the separator in the holes at the top-rear of the case.

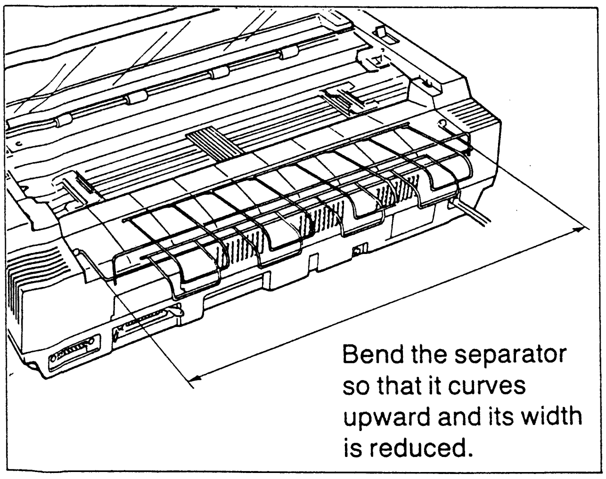

Bend the separator so that it curves upward and its width is reduced.

Figure 2.5 Installing the Paper Separator

2.4 DIP Switches

DIP switches allow the user to set certain operating conditions of the printer. The switches are read into memory on power up. These memory locations then contain an image of the switch settings. The computer can change the contents of the memory and thereby effectively change the switch settings. Character sets, skip perforation etc. can be changed in this manner. Refer to sections 6, 7 and 8 for information regarding software control of the switches. Figure 2.6 shows the location of the DIP switches at the rear of the printer. Table 2.8 lists the settings of switch banks SW1, SW2 and SW3.

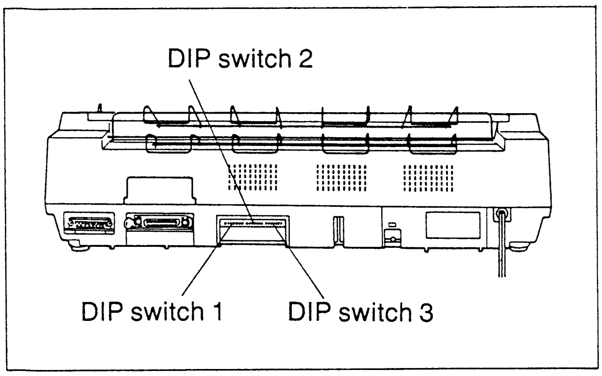


Figure 2.6 Location of DIP switches

SW1-1 and SW1-2 Printer Mode

These two switches select the printer mode. Table 2.3 lists the setting for each mode. The setting cannot be changed through software commands.

SW1-1	SW1-2	Printer Mode
ON	ON	EPSON LQ-1500 Mode
OFF	ON	IBM Proprinter Mode (Character Set 1)
ON	OFF	IBM Proprinter Mode (Character Set 2)
OFF	OFF	Diablo 630 Mode

Table 2.3 Printer Mode

SW1-3 Auto Line Feed

ON A line feed (LF) command is added to each carriage return (CR) command received.

OFF Performs a carriage return only.

The setting can be changed through software commands in IBM Proprinter mode.

SW1-4 Skip Perforation

ON Total of 1 inch (25.4 mm) margin is skipped before and after the page perforation.

OFF Printing is continuous. No margins around perforation.

The setting can be changed through software command in Epson LQ-1500 and IBM Proprinter modes.

SW1-5, -6 & -7 International Character Set

Selects one of 8 international character sets. Table 2.4 shows the settings. The character sets are located in Appendix A. These settings can be changed through software commands in Epson LQ-1500 and Diablo 630 modes.

SW1-5	SW1-6	SW1-7	INTERNATIONAL CHARACTER SET
ON	ON	ON	USA
OFF	ON	ON	FRANCE
ON	OFF	ON	GERMANY
OFF	OFF	ON	ENGLAND
ON	ON	OFF	DENMARK I
OFF	ON	OFF	SWEDEN
ON	OFF	OFF	ITALY
OFF	OFF	OFF	SPAIN

Table 2.4 International Character Set

SW1-8 Paper Out Detector

ON Detector is ignored.

OFF Detector is active.

This setting is effective only in tractor feed mode. In friction feed mode the paper out detector is ignored. The setting can be changed through software command in Epson LQ-1500 and IBM Proprinter modes.

SW2-1 Down Line Load Buffer

This switch allows part of the buffer to be used for down line load characters. This capability requires the installation of the 32K RAM buffer option. Up to 128 draft and 128 LQ characters may be downloaded leaving 25.5K bytes as a receive buffer.

ON Available

OFF Not available

The setting cannot be changed through software commands.

SW2-2 Right Margin

When used in 8 inch mode the printer will not print on the platen when using 8½"×11" paper.

ON 8 inches

OFF 13.6 inches

SW2-3 Cut Sheet Feeder

The form length is normally controlled by the page length selector switch on the front panel or by a software command. However, the paper feed mechanism of the cut sheet feeder requires that the form length be set to 15 inches (381 mm). When the cut sheet feeder option is used, SW2-3 must be set to ON for the form feed to function properly. If a cut sheet feeder is not used, SW2-3 should be in the OFF position.

The setting cannot be changed through software commands.

SW2-4 Zero Font

ON Zero=0

OFF Zero=0

The setting cannot be changed through software command.

SW2-5 Alarm

This switch determines if the alarm set through software commands is enabled or disabled.

ON Alarm sounds.

OFF Alarm does not sound.

The setting cannot be changed through software commands.

SW2-6 Automatic CR

ON A carriage return (CR) command is added automatically to LF, VT, ESC+J command.

OFF LF, VT, ESC+J command only.

This switch is effective only in IBM Proprinter mode.

SW2-7 & SW2-8 Interface and Protocol

These two switches select interface condition between printer and computer. Table 2.5 shows the interface conditions.

The setting cannot be changed through software commands.

SW2-7	SW2-8	Interface & Protocol
ON	ON	8 bit Parallel I/F
OFF	ON	Serial I/F DTR
ON	OFF	Serial I/F XON/XOFF
OFF	OFF	Not Used

Table 2.5 Interface & Protocol

SW3-1	SW3-2	SW3-3	Baud Rate
ON	ON	ON	150
OFF	ON	ON	300
ON	OFF	ON	600
OFF	OFF	ON	1200
ON	ON	OFF	2400
OFF	ON	OFF	4800
ON	OFF	OFF	9600
OFF	OFF	OFF	Not Used

Table 2.6 Serial I/F Baud Rate

SW3-4	SW3-5	Parity control
ON	ON	No Parity
OFF	ON	Ignore Parity
ON	OFF	Odd Parity
OFF	OFF	Even Parity

Table 2.7 Parity control

Switch bank 3 is used only when the serial interface is selected by SW2-7 and SW2-8.

SW3-1, -2, -3 Baud Rate

These three switches set data transfer speed between computer and printer. Table 2.6 shows the baud rate settings.
The setting cannot be changed through software commands.

SW3-4 & -5 Parity Control

These two switches set parity control. Table 2.7 shows the parity control conditions.
The setting cannot be changed through software commands.

SW3-6 Signal Polarity

This switch sets the polarity of DTR signal for the serial interface.

ON When the signal is "space", the printer tells the computer that it cannot accept transferring data.

OFF When the signal is "mark", the printer tells the computer that it cannot accept transferring data.

The setting cannot be changed through software commands.

SW3-7 Remaining Buffer Capacity

This switch sets the remaining receive buffer capacity when the printer tells its acceptance of data from the computer for serial interface.

ON 152 bytes
OFF 288 bytes

The setting cannot be changed through software commands.

SW3-8 Data Length

This switch sets data bit length for the serial interface.

ON 7 bits
OFF 8 bits

The setting cannot be changed through software commands.

SWITCH NUMBER	FUNCTION	ON	OFF	POSITION WHEN SHIPPED
SW1-1	Printer Mode	See Printer Mode Table (Table 2.3)		ON
SW1-2				ON
SW1-3	Automatic LF	CR+LF	CR only	OFF
SW1-4	Skip Perforation	1 inch (25.4 mm) Skip	No Skip	OFF
SW1-5	International Character set	See International Character Table (Table 2.4)		ON
SW1-6				ON
SW1-7				ON
SW1-8	Paper Out Detector	Ineffective	Effective	OFF
SW2-1	Download buffer	Enable	Disable	OFF
SW2-2	Right Margin	8 inch	13.6 inch	OFF
SW2-3	Cut Sheet Feeder Option	Installed	Not Installed	OFF
SW2-4	Zero Font	Zero Slash	Zero	OFF
SW2-5	Alarm	Enable	Disable	ON
SW2-6	Automatic CR	Causes Automatic CR on LF, VT, ESC+J	Prevents Automatic CR on LF, VT, ESC+J	ON
SW2-7	Interface & Protocol	See Interface & Protocol Table (Table 2.5)		ON
SW2-8				ON
SW3-1	Baud Rate	See Serial I/F Baud Rate Table (Table 2.6)		OFF
SW3-2				OFF
SW3-3				OFF
SW3-4	Parity control	See Parity control Table (Table 2.7)		OFF
SW3-5				OFF
SW3-6	Signal polarity	Reverse	Normal	OFF
SW3-7	Remaining buffer capacity	152 byte	288 byte	OFF
SW3-8	Data length	7 bit	8 bit	OFF

Table 2.8 DIP Switch Settings

2.5 Paper Installation

The paper feed mechanism can handle single sheet paper and envelope or fanfold paper. Alternating between the two is accomplished by using the lever on the left side of the printer labeled "F" (friction) and "T" (tractor). In the friction mode the paper is held by pinch rollers which press the paper against the platen. This mode is used for single sheets and envelopes. The tractor mode is for use with fanfold paper. This printer uses push-type tractors. This allows continuous forms to be torn off without wasting a copy between printouts. Refer to following paper installing procedures.

Single Sheet and Envelopes

To install a single sheet of paper or envelopes, follow these procedures.

- Turn the power switch ON. A one second beep will sound.
- Place the PAPER FEED selector in the "F" position. Refer to Figure 2.7A.

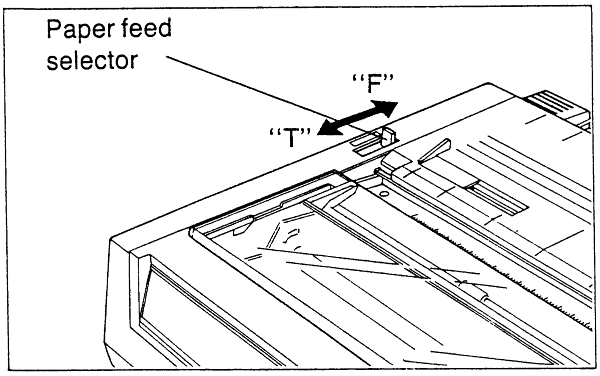


Figure 2.7A Paper Feed Selector

- Raise the top cover and insert the paper behind the platen as Figure 2.7B shows. Use the markings and paper guide on the top cover as a guide.
- Pull the paper bail release lever toward the front of the printer to wrap the paper automatically around the platen. Then push it back into its original position.
- Press down and hold the line feed switch (LF) to advance the paper.

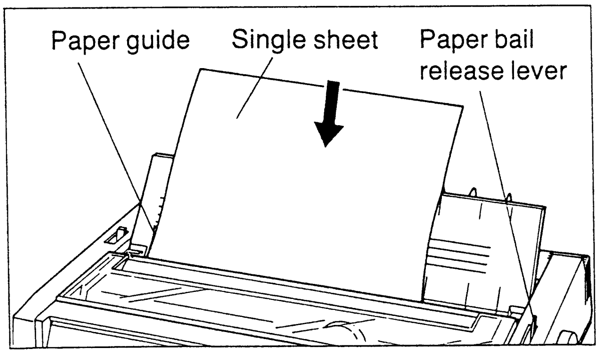


Figure 2.7B Inserting a Single Sheet

- To align the paper horizontally or vertically, set the paper feed selector to the "T" position. This releases the pinch rollers and allows the paper to be positioned as required.
- Set the selector back to "F" before printing.

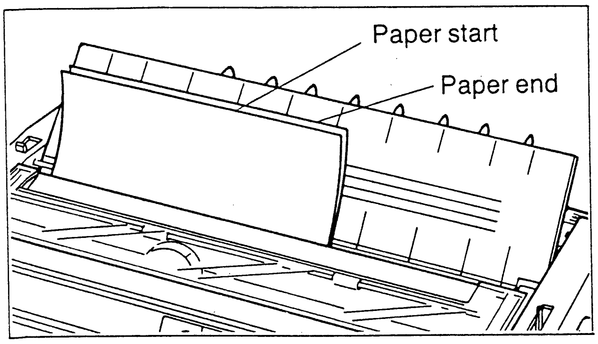


Figure 2.7C Aligning a Single Sheet

Fanfold Paper

The following steps describe how to load fanfold paper:

- Turn the power switch ON. A one second beep will sound.
- Remove the top cover as shown in Figure 2.8A.

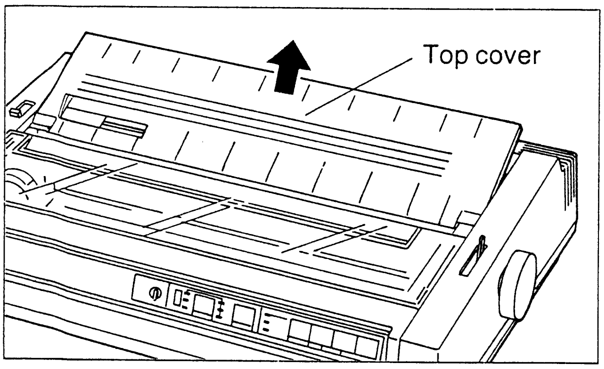


Figure 2.8A Removing the Top Cover

- Refer to Figure 2.8B. Unlock the tractors by pulling forward on the tractor clamping levers.
- Slide the tractors out toward the sides and raise the covers.
- Place the paper feed selector in the "T" position.
- Align 4-5 paper sprocket holes with tractor pins and close tractor covers.
- Center the paper horizontally without any slack, using the scale on the scale plate as a guide. The printer will print between 0 and 136 on the scale (PICA).
- Press back on the tractor clamping levers locking the tractors in place.
- Pull the paper bail release lever toward you to advance the paper.

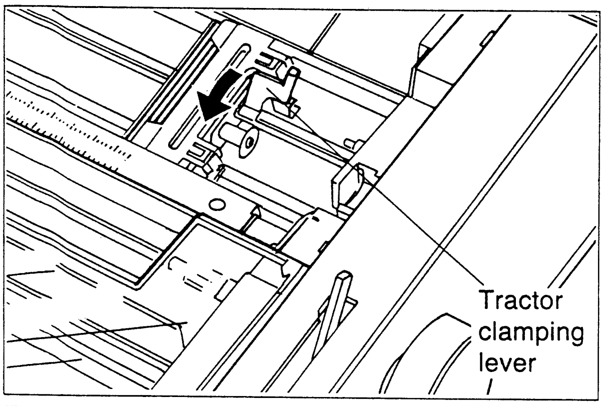


Figure 2.8B Unlocking the Tractors

- Push the paper bail release lever toward the platen.
- Visually insure the tractor pins are in the center of the paper sprocket holes.
- Press down and hold the line feed switch (LF) to advance the paper.
- Rotate the platen knob in the reverse direction to adjust printing position.

- Replace the top cover as shown in Figure 2.8C.

Note: Position four bail rollers at the same intervals on the paper.

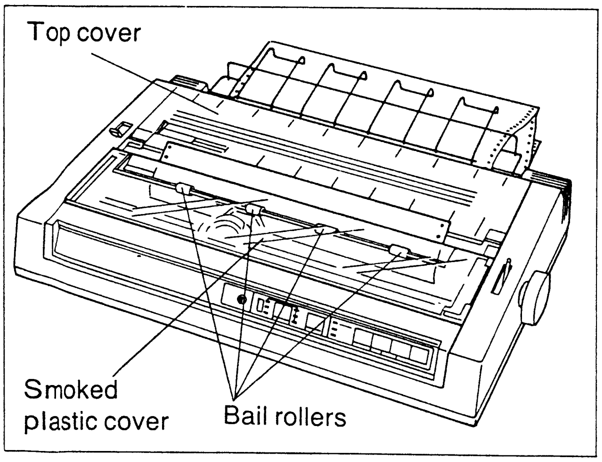


Figure 2.8C Replacing the Top Cover

Stacking fanfold paper

To insure smooth paper flow when using fanfold paper, be sure the paper is not stacked higher than the paper separator. By feeding the paper as shown in Figure 2.9, the weight of the paper will provide reverse tension. The paper should be directly behind the printer and not off to one side.

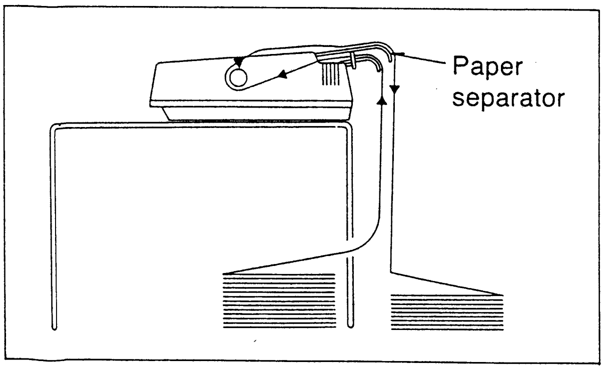


Figure 2.9 Stacking Fanfold Paper

2.6 Adjusting the printing head gap

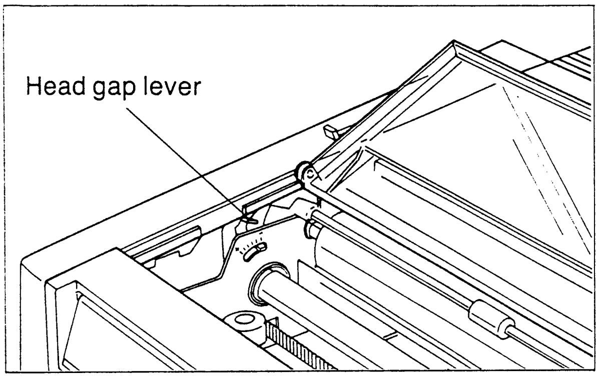


Figure 2.10 Adjusting the Head Gap

HEAD GAP LEVER ADJUSTMENT
Be sure to set the lever properly.

–

1	1 sheet
2–3	3 non-carbon multi-layer sheets
4–6	When more gap required, envelope

+

Table 2.9 Head Gap Adjustment

The distance between the printing head and platen can be adjusted to compensate for the thickness of the paper.

Figure 2.10 shows the location of the head gap lever.
The 6-position head gap lever moves the print head closer to or farther away from the platen approximately 0.0028 inch (0.07 mm) per step. To avoid the possibility of print head or ribbon damage, the head gap lever should always be set to the upper position (-) when printing on single sheet paper. For thick paper or multi-part forms, move the lever toward the lower position (+). Maximum paper thickness is 0.013 inch (0.32 mm).

Note:
When the printer is shipped the head gap lever is set to the lower position (+).

2.7 Power Up

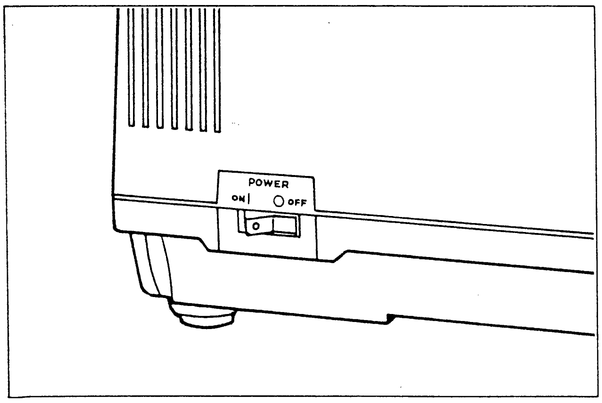


Figure 2.11 Power Switch

The power switch is located on the left side of the printer toward the rear as shown in Figure 2.11. It is used to turn the AC power ON or OFF. When the power is supplied to the printer the power indicator light on the front panel will light.
The following procedures should be followed when turning the printer on:

1. Insure that the printer carriage stopper has been removed.
2. Load the paper and set the paper feed selector in the proper position.
3. Be sure the ribbon is installed correctly.
4. Set the DIP switches as required.
5. Turn the power switch off and plug the power cord into an outlet of the proper rating.
6. Turn the power on.

2.8 Aligning the top of form

This printer has a line counter which keeps track of the vertical position of the print head. Each time power is turned on the line counter is reset and the current position of the head is designated as line one. This location is referred to as TOP OF FORM. A page is defined by the page length designation command. The first line of text will begin 1/6" (4.2 mm) from the top edge of the back tension plate. Refer to the Figure 2.12.

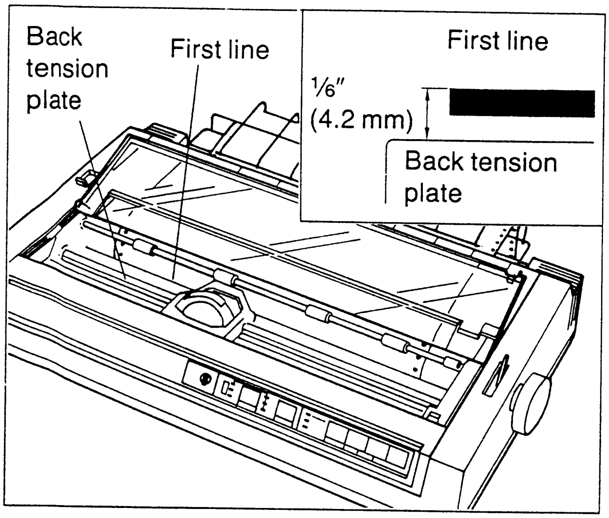
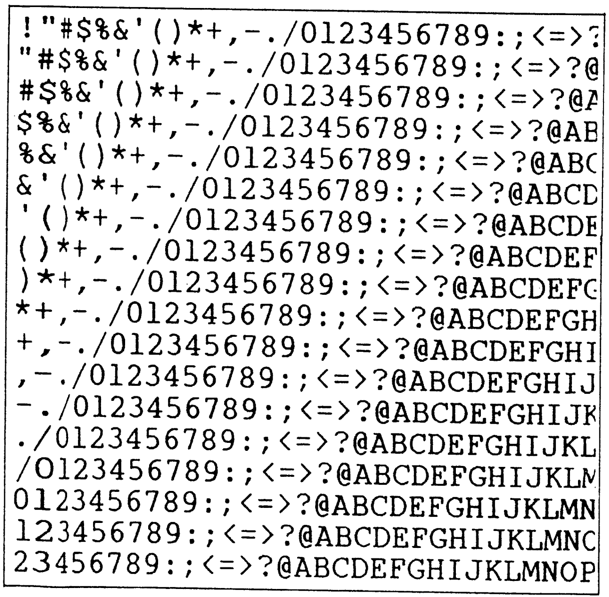


Figure 2.12 Aligning the Top of Form

2.9 Self Test

The printer has a self test feature which allows the user to test the printer independently. The mode is entered by turning on the power switch while pressing the line feed (LF) switch. All 96 ASCII characters will be printed continuously until the power is turned off. The FONT and PITCH selector switches are active in self test. Even though the printer is in the Pgm mode when power is turned on, other modes can be tested by pressing the FONT and the PITCH Selector Switches. The self test will stop automatically in approximately 15 minutes (with draft character printing). To release the self test mode turn the power off.



```
!"#$%&'()*+,-./0123456789:;<=>?
"#$%&'()*+,-./0123456789:;<=>?@
#$%&'()*+,-./0123456789:;<=>?@A
$%&'()*+,-./0123456789:;<=>?@AB
%&'()*+,-./0123456789:;<=>?@ABC
&'()*+,-./0123456789:;<=>?@ABCD
'()*+,-./0123456789:;<=>?@ABCDE
()*+,-./0123456789:;<=>?@ABCDEF
)*+,-./0123456789:;<=>?@ABCDEFG
*+,-./0123456789:;<=>?@ABCDEFGH
+,-./0123456789:;<=>?@ABCDEFGHI
,-./0123456789:;<=>?@ABCDEFGHIJ
-./0123456789:;<=>?@ABCDEFGHIJK
./0123456789:;<=>?@ABCDEFGHIJKL
/0123456789:;<=>?@ABCDEFGHIJKLM
0123456789:;<=>?@ABCDEFGHIJKLMN
123456789:;<=>?@ABCDEFGHIJKLMNO
23456789:;<=>?@ABCDEFGHIJKLMNOP
```

Figure 2.13 Self Test

2.10 Connecting to Computer

The printer communicates with the computer through a parallel interface cable or a serial interface cable. The printer has both Centronics and RS-232-C serial interfaces as standard. The user needs an interface cable to connect the printer to the computer.

See Section 9 "Interfaces" for detailed information.

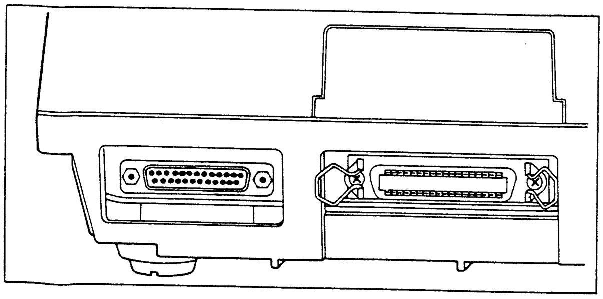


Figure 2.14 Interface Connectors

3. Operation

3.1 Front Panel Switches

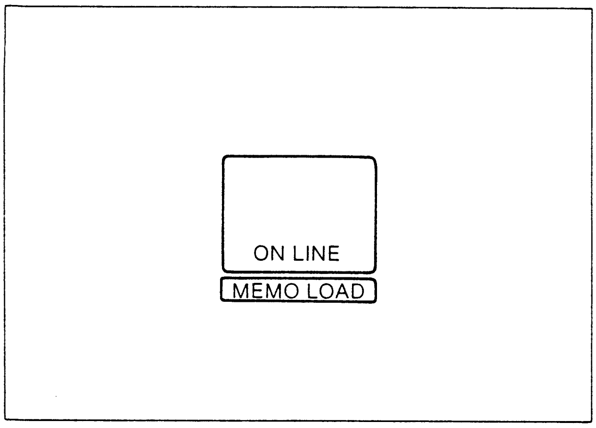


Figure 3.1 ON LINE Switch

ON LINE switch

The ON LINE switch is an alternate action switch which opens and closes the communications line with the computer. When the power switch is turned on, the printer will power up in the ON LINE mode if paper is installed and the smoked plastic cover is closed. If paper is not installed or the smoked plastic cover is opened, the printer will power up in the OFF LINE mode. The printer can be switched between the ON LINE and OFF LINE modes by pressing the ON LINE switch.
If the printer is in the ON LINE mode and a paper out condition occurs, or the smoked plastic cover is raised, or the ON LINE switch is pressed, the printer will switch to the OFF LINE mode and the indicator light will be out.
In the ON LINE mode, the printer is able to receive information from the computer and the ON LINE indicator will be lit. When OFF LINE, the indicator light will be out and the printer can no longer receive data.

This switch is also used to allow loading a single sheet when the FUNCTION switch is pressed.

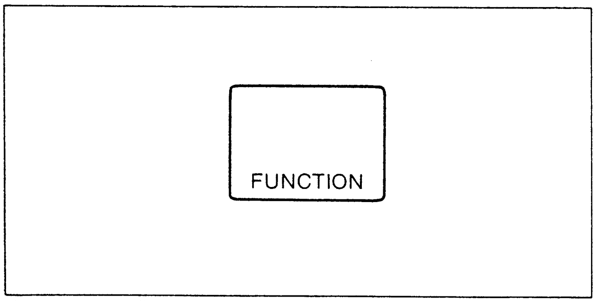


Figure 3.2 FUNCTION Switch

FUNCTION switch

This switch is an alternate switch and used in conjunction with the front panel switches to give them new functions. When this switch is activated the ON LINE indicator starts blinking. In this mode the front panel switches have new functions as shown in Table 3.1.
Press the switch to return to normal mode.
See Section 3.2 "Function Mode" for detailed information.

Panel Switch	Alternate Function
LF	Moves carriage to right
FF	Moves carriage to left
ON LINE	Ejects continuous paper
FONT	Sets right margin
PITCH	Sets left margin

Table 3.1 Panel Switch Alternate Function

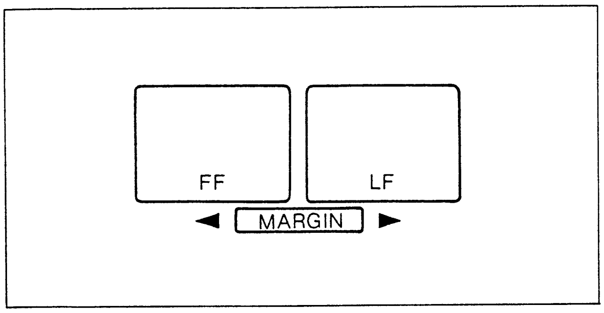


Figure 3.3 FF & LF Switches

LF (Line Feed) switch

This switch is active in the OFF LINE mode and when the printer is not printing in the ON LINE mode. Pressing this switch will cause the paper to advance one line. Multiple line feeds can be performed by holding the switch down. The print head is in the skip perforation area, the paper will advance to the top of the next page.

This switch moves the carriage toward right when the FUNCTION switch is pressed.

FF (Form Feed) switch

This switch is active in the OFF LINE mode and when the printer is not printing in the ON LINE mode. Pressing the FF switch will advance the paper from its current location to the top of the next page. Then a new top of form is established. The FF switch is not active in a paper out condition.

This switch is used to move the carriage toward left when the FUNCTION switch is pressed.

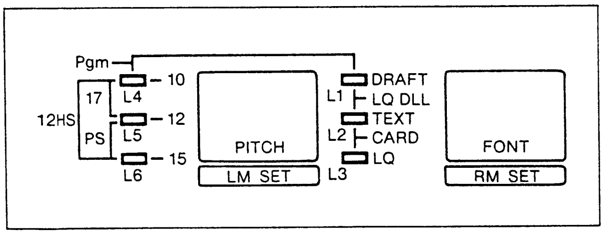


Figure 3.4 PITCH & FONT Switches

	L1	L2	L3	FONT
1	ON	OFF	OFF	DRAFT
2	OFF	ON	OFF	TEXT
3	OFF	OFF	ON	LQ
4	ON	ON	OFF	LQ DLL
5	OFF	ON	ON	CARD

Table 3.2 FONT Selection

FONT selector switch

The FONT selector switch allows the user to choose among print styles. The light on the front panel indicates the current print font. The default condition (the mode selected when power is turned on) is DRAFT. When the switch is pressed the print font will advance to the next position. Table 3.2 shows the status of the lights for each font. The printer has three basic print fonts- Draft, Text and Letter Quality (LQ). When an optional font card is installed in the printer, an external font is available by selecting CARD. If an optional font card is not installed, L2 and L3 indicators blink continuously. When the LQ DLL is selected, letter quality download characters are printed. Font selections through software commands can be made only when the printer is in Pgm (DRAFT, 10 cpi) mode. The indicator lights will not change when the mode is changed through software commands.

The FONT selector switch is used to set a right margin position when the FUNCTION switch is pressed.

PITCH selector switch

This printer has 5 character pitch selections. They are 10, 12, 15 & 17 characters per inch (cpi) and proportional spacing (PS). The PITCH selector switch allows the user to change these character pitches. The light on the front panel indicates the current character pitch. The default condition (the pitch selected when the power is turned on) is 10 cpi. When the switch is pressed the pitch will advance to the next position. Proportional spacing is effective only for letter quality fonts. When the FONT selector switch is set DRAFT or TEXT, L5 and L6 indicators blink continuously. Table 3.3 shows the status of the lights for each character pitch. In 12 HS mode characters will be printed in 12 cpi at 20 percent higher speed.

The PITCH selector switch is also used to set a left margin position when the FUNCTION switch is pressed.

Note: Pitch selections through software commands can be made only while the printer is in Pgm (DRAFT, 10 cpi) mode. The indicator lights will not change when the mode is changed through software commands.

	L4	L5	L6	PITCH
1	ON	OFF	OFF	10 CPI
2	OFF	ON	OFF	12 CPI
3	OFF	OFF	ON	15 CPI
4	ON	ON	OFF	17 CPI
5	OFF	ON	ON	PS
6	ON	OFF	ON	12 HS

Table 3.3 PITCH Selection

FORM LENGTH selector switch

The form length selector switch sets the form length in inches. The setting of the switch is sensed automatically when the power is turned on or when the switch setting is changed. A new top of form position is set each time the form length is changed, either through the form length software command or by changing the switch setting.

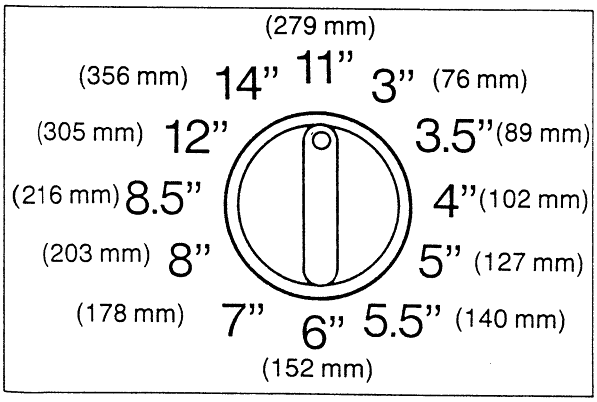


Figure 3.5 FORM LENGTH Switch

3.2 Function Mode

Memo Load

This printer can use single sheet, envelopes and fanfold paper. When you use single sheet or envelopes without removing the fanfold paper:

1. First, tear off the printed pages of the fanfold paper.
2. Turn the power on and press the FUNCTION switch. The ON LINE indicator will start blinking. This indicates the printer is in the function mode.
3. Press the ON LINE switch. The fanfold paper will go back halfway and stop. The ON LINE indicator will stop blinking and the printer automatically goes back to normal mode.
4. Move the paper feed selector to "F" position.
5. Raise the top cover and insert a single sheet.
6. Move paper bail release lever toward the front of the printer to wrap the paper automatically around the platen. Then push it back to its original position.

Now you can print on the single sheet.

When printing on the single sheet is done, remove it by rotating the platen knob. Then move the paper feed selector to "T" position and pull the paper bail lever toward you to advance the fanfold paper to print start position.

Margin Control

Left and right margins can be set not only through software commands but also using the front panel switches. Use the following procedure:

1. First turn the power on and press FUNCTION switch on the front panel. The ON LINE indicator will start blinking. This means the printer is in the function mode. In the function mode each front panel switch has the following function:

Panel switch	**Function**
LF	Moves carriage to right.
FF	Moves carriage to left.
PITCH	Sets left margin position.
FONT	Sets right margin position.

2. Press and hold down LF or FF switch to move the carriage to a desired left (or right) margin position.
3. Press the PITCH or FONT selector switch to set left (or right) margin.
4. After setting left and right margins press the FUNCTION switch to return the printer to normal mode. The ON LINE indicator will stop blinking.

Note:

1. You can set either left or right margin first.
2. In the function mode, when moving the carriage by using LF and FF switches, if the carriage reaches an end of the platen the carriage will move rapidly to opposite side. This is helpful in moving the carriage to the second margin position when the first is far from it.

3.3 Print Feature Control

Print Quality and Font

This printer has a wide variety of print capabilities as shown below. The user can select any print mode by combining them.

Quality	Font	Pitch	Highlight
Draft		10	Double width
Text		12	Emphasize
Letter Quality	Courier	15	Double strike
	Option Font	17	Underline
	Superscript	PS	Overline
	Subscript	12HS	(IBM)
	Italic		Bold, Shadow
			(Diablo 630)

This printer has three print quality levels: Draft, Text and Letter Quality. You can select any level for your needs. Draft is printed at the fastest speed and is normally used for printing draft documents. Letter Quality produces the best print quality; it is used to print the final version of formal documents. The printer has two kind of letter quality fonts. They are internal letter quality font (Courier) and external letter quality fonts which are supplied as optional font cards.
Super/subscript font characters are two thirds the height of normal characters and are typically used in mathematical expressions, chemical formulae, and footnoting.

Each print quality mode allows a wide variety of output by mixing character pitches and highlighting by the PITCH selector switch on the front panel or through software commands.

Character Pitch

This printer has six character pitches: 10 cpi (Pica), 12 cpi (Elite), 15 cpi (Micron), 17 cpi (Compressed), 12 cpi High Speed (HS) and Proportional Spacing. Each character pitch gives the same height but different horizontal dot pitches to characters. In proportional spacing, the spacing of each character varies. For example, an "I" will take up less space than an "M" or a "W". Proportional printing gives the document a typeset appearance. Letter quality font can be printed in proportional spacing, draft and text fonts, however, cannot. In 12 cpi HS, draft characters are printed at a higher speed (240 cps) than normal (200 cps) in elite pitch, text characters are printed at a higher speed (160 cps) than normal (133 cps) and letter quality characters are printed at a higher speed (80 cps) than normal (67 cps) in elite pitch.

(Print Example)

10 cpi printing (Pica)
12 cpi printing (Elite)
15 cpi printing (Micron)
17 cpi printing (Compressed)

12 cpi High Speed printing (HS)

Character Highlighting

This printer allows a document a wide variety of print styles by mixing fonts and pitches.

Double width printing makes the width of a character twice that of normal one.

Double printing uses a double strike with two passes of the print head, feeding the paper 1/180" (0.14 mm) between the first and second pass.

Emphasized printing makes two passes of print head, the second strike is performed slightly to the right of the first.

Diablo 630 mode, bold printing prints on the same location twice, and **shadow printing** makes two passes of the print head, the second strike is performed 1/120" (0.21 mm) to the right of the first.

Underline printing produces continuous line under characters, using 24th pin of the print head.

IBM Proprinter mode has **overline printing** which uses the first pin of the print head.

(Print Example)

Double Width
Double Printing
Emphasized Printing
Bold Printing
Shadow Printing
Underline Overline Printing

Front panel switch control

This printer has FONT and character PITCH control switches on the front panel. If your packaged software does not provide print quality or size commands, these switches provide an easy way of doing so. Setting the FONT switch to letter quality (LQ) for example, allows the printing of a draft document in letter quality without any software change. The FONT switch offers five choices, the PITCH switch offers six.

Setting the FONT and PITCH switches to any combination other than DRAFT and 10 cpi overrides any software commands addressing these functions. To allow software to control font and pitch, you must have the FONT switch set to DRAFT and the PITCH switch set to 10 cpi.

Font Card Option

This printer has 7 LQ font card options—Bold PS, Roman, Prestige, Gothic, Sans Serif, Orator and Script. Ask your dealer for availability.

Installation

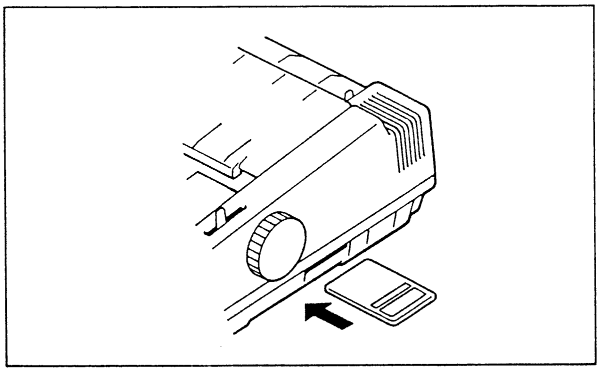


Figure 3.6 Installing the Font Card

- Before inserting and removing the font card, the power of the printer must be turned off.
- Gently insert or remove the font card into or from the printer.
- When inserting, push the font card until it stops with a click.

Operation

- Set the FONT selector switch on the front panel to "CARD" when you print your document with LQ font contained in the font card.

Caution

- Keep the font card in its protective cover when it is not installed in the printer.
- Keep the font card from direct sunlight or high temperature.
- Do not bend or subject the font card to strong shocks.
- Keep the font card away from water or other liquids.
- Do not touch the font card's connector.

3.4 Detectors

Out of paper detector

This printer has two paper out detectors. One is located under the platen. The other is located at the bottom and used only with the bottom feed tractor option. They sense the absence of paper. When an out of paper condition occurs, the printing stops, the printer goes to the OFF LINE mode, and the alarm sounds, and the Paper Out light is lit. To continue printing to the end of current page when out of paper condition occurs, press the ON LINE switch. To resume printing after paper out condition, install the paper and press the ON LINE switch. The printer will start printing.

The Paper Out detector will be disabled under the following conditions:
- The paper feed selector is set to friction feed.
- DIP switch SW1-8 is ON.
- The paper out detector is disabled by a software command.
- The smoked plastic cover is open.

Over heat detector

If the printer is printing continuously for extended periods of time, the printhead may become overheated. When this occurs, an internal protective circuit will cause the printer to quit printing and the alarm will sound at one second intervals. This condition will remain in effect until the head temperature decreases sufficiently, at which time the printer will automatically resume printing.

Cover open detector

When the smoked plastic cover is opened, the printer detects it and goes to the OFF LINE mode after printing to the end of the current line. The print head moves to the auto paper loading position and sounds the alarm five times. When the ON LINE switch is pressed after closing the cover, the print head returns to the home position, and the printer starts printing.

3.5 Initialization

The printer is initialized under the following conditions:

-The AC power is turned on
-The PRIME signal is received
-The RESET command is received

When the printer is initialized, the following conditions are set:

-The print head goes to the home position
-The print buffer is cleared
-The receive buffer is cleared (not cleared by RESET PRINTER command)
-Vertical tab settings are cleared
-Horizontal tabs are set every 8 columns (Epson/IBM Printer mode)
-Horizontal tabs are cleared (Diablo 630 mode)
-The DIP switches are read and printer modes set
-Print mode is set to Pgm by power on
-Print mode set by selector switch is not changed by PRIME signal, RESET PRINTER command*
-Present form position is designated as top of form
-All modes set by control and escape commands will be cleared
-The printer goes ON LINE
-The form length is set according to the position of the form length selector switch
-The download character buffer is cleared (not cleared by PRIME signal in IBM Proprinter mode)

*Some software packages send PRIME signal at the beginning of their programs. Print modes set by the selector switch will not change.

3.6 Hex. Dump

The HEX. DUMP mode is activated by turning on the power while pressing both the line feed (LF) and form feed (FF) switches. In this mode, all data received from the computer is printed in hex. code instead of the normal ASCII characters. Function codes for the printer (CR, LF, HT, etc.) are not executed. To reset the mode, turn the power off, then back on.

4. Software Introduction

4.1 Introduction

In order for a computer to communicate with a printer, both pieces of equipment must understand a common language or coding scheme. One such coding scheme is called ASCII (American Standard Code for Information Interchange). As an example, the ASCII code for the character "K" can be expressed in any of the following forms:

$(01001011)_2$—Binary
$4B_{HEX}$, $4B_H$—Hexadecimal
75_{DEC}, 75_D—Decimal

Many computers allow you to enter ASCII codes in hexadecimal form. Most computers which support ASCII allow the input to be in decimal form. Many allow you to enter the code in either form. Once entered, the ASCII codes are converted to binary form by the computer and then sent to the printer.

In the sections which follow, you will see how to enter various ASCII codes to enable the printer to perform the functions you would like. Since the decimal equivalent of the ASCII code is most commonly used, all examples which follow will use the decimal form.

Appendix A contains the ASCII character and control command tables used by this printer.

4.2 Control Codes

The various printer functions are set through the use of control codes, which consist of one or more ASCII characters entered into the computer in a special way. These control codes often differ from printer to printer. Control codes generally fall into two categories: one-byte control codes and multi-byte control codes. The multi-byte control codes are often referred to as Escape Sequences since each code begins with the ASCII code for the ESCAPE character (ESC). Such an ESC character should not be confused with the Escape Key found on some computer keyboards.

Control codes can be sent to this printer from your computer in different ways. The three most common ways are:

- Through commercial software packages
- Directly from the keyboard
- From within a user-written program

The latter two methods will specifically reference the BASIC language, although other languages such as FORTRAN, PASCAL, etc., can also be used. We will use BASIC since it is relatively easy language to use. In addition it is the most commonly used microcomputer language.

4.3 Entering Control Codes through Commercial Software Packages

Many computer users do not have the time, the expertise, or the interest to develop software suited for their applications. In such cases software written by professionals can be purchased. Such software should be selected not only to meet the needs of the user, but must also be compatible with both computer and printer.

Commercial software is often written with what is called a driver. A driver is that part of the software which allows the user to configure the package to the type of printer and interface being used. Once the software has been booted, the user is generally requested to supply additional information such as:

- Brand/Model of printer being used.

- Slot number in which interface card is installed.

- Baud rate, parity, etc. if a serial interface is being used.

Once the necessary information has been supplied, the software will provide the computer with the control codes and other data needed by this printer.

Many word processing packages will request that you enter the ASCII codes used by this printer for special settings such as underlining, compressed print, super- and subscript, italics, etc.. In all cases you should refer to your software instruction manual for the proper use of the package with this printer.

4.4 Entering Control Codes Directly from the Keyboard

With many computers, the BASIC language is ready to use once you power up. With others, BASIC must be loaded from cassette or disk. In any case, once BASIC is ready, you may then enter these printer control commands directly from your computer keyboard.

BASIC requires the use of the PRINT command (or LPRINT, PRINT#, etc. depending on the type of BASIC your computer uses) to process and send the control commands to this printer. As part of this PRINT command, you must supply the appropriate ASCII code(s) for the CHR$ function.

For example, the command: **LPRINT CHR$(15)** followed by a **RETURN** will set this printer to compressed mode. Subsequent output to this printer will appear in compressed mode.

If, after issuing the above command, subsequent PRINT statements output nothing to the printer, check for one or more of the following:

- Have you indicated to the computer that output is to the printer and not the screen? For example, PR#1, say, causes subsequent PRINT statements on the Apple® computer to PRINT the printer and not the screen. LPRINT does the same in Microsoft® BASIC.
- Is this printer on line? If not, press the green ON LINE button on the front panel.
- Is the interface cable plugged into the computer and printer?
- When using a serial interface, is the baud rate setting on the printer the same as that on the computer or interface card?

Notice that when you enter a BASIC command directly from the keyboard, you do NOT use a line number as you would in a BASIC program. Moreover, control codes may be entered only one line at a time.

4.5 Entering Control Codes from Within a Program

Control commands may also be entered from within a BASIC program. The advantage to this technique is that you can incorporate a number of different control commands into a single program and therefore produce output with a variety of special features. This is done by RUNning your program once. In this case BASIC requires that each line in your program be preceded by a line number.

As an example, we mentioned earlier that the command **LPRINT CHR$(15)** entered directly from the keyboard will set compressed print on this printer. From within a BASIC program, this command might be:

```
50 LPRINT CHR$(15)
```

The following chapters will show you how to enter each of the control commands which this printer uses.

4.6 Entering Hexadecimal Code

In the event that you will be entering ASCII codes in hexadecimal form, you must supply two extra characters per code. These are the ampersand (&) and the letter H. The example below illustrates the BASIC command to set compressed print on this printer.

Decimal	Hexadecimal
LPRINT CHR$(15)	**LPRINT CHR$(&H0F)**

Refer to Appendix A for the ASCII code table.

4.7 Control Codes

A number of the printer control commands require only a single ASCII-coded character as part of the LPRINT statement. The command LPRINT CHR$(15) which we discussed earlier is an example of a single-byte control command.

Multi-byte control codes, often called Escape control codes or Escape sequences, always begin with an ESC designation. ESC is designated by CHR$(27) in decimal form or CHR$(&H1B) in hexadecimal form. The ESC designation is always followed by one or more additional codes, hence, the name multi-byte control code.

In BASIC, these two or more bytes are joined (or concatenated) into a single command or string using either a plus (+) sign, a semicolon (;), or by neither symbol but rather by listing one byte after another without any spaces. BASIC on many computers allows you to use any of these formats. Refer to your BASIC manual for the proper method of string concatenation.

Table 4.1 shows equivalent methods of entering multi-byte control commands for most computers.

There is one remaining input format commonly used to reduce the keystrokes necessary to enter a multi-byte control command. As you examine the multi-byte control commands in the pages ahead, you will notice that the second byte, with the exception of ESC+SO and ESC+SI, is always a character which appears somewhere on your keyboard. In such cases, rather than enter that character's ASCII code as part of the CHR$ function, you may simply enter that character in quotes ("). For example, to set pica pitch (ESC+P), you may enter:

```
LPRINT CHR$(27)+CHR$(80);
        or
LPRINT CHR$(27)+"P";
```

As another example, to set double width printing, you may enter:

```
LPRINT CHR$(27)+CHR$(87)+CHR$(1);
        or
LPRINT CHR$(27)+"W"+CHR$(1);
```

With this method, any of the three input formats shown in Table 4.1 may also be used (subject to the BASIC you are using).

This printer has three printer modes. They are Epson LQ-1500, IBM Proprinter and Diablo 630 mode.

Software commands of each mode are covered in the corresponding chapter.

	Two-Byte Command	Three-Byte Command
Function **Name** **Code**	Set Pica Pitch ESC+P 27,80 DEC	Set Double Width Printing ESC+W+1 27,87,1 DEC
Input Format 1 **Input Format 2** **Input Format 3**	LPRINT CHR$(27)+CHR$(80); LPRINT CHR$(27);CHR$(80); LPRINT CHR$(27)CHR$(80);	LPRINT CHR$(27)+CHR$(87)+CHR$(1); LPRINT CHR$(27);CHR$(87);CHR$(1); LPRINT CHR$(27)CHR$(87)CHR$(1);

Table 4.1 Input Formats

5. KX-P1524 Features

5.1 Down Line Load Characters

If the printer does not contain all the characters you need, with the 32 K byte option you can custom design and load up to 18 K bytes of characters. Draft and letter quality fonts are downloadable simultaneously. Draft download characters are printed when the printer is in draft mode; LQ characters are printed when it is in LQ mode.

Note: Down line load command in IBM Proprinter mode does not have compatibility with IBM Proprinter.

Making Maximum use of the buffer

The 18 K (18, 432) bytes available can be divided between draft and letter quality characters in any combination, subject to hexadecimal address and buffer limits. Draft letters require 30 bytes each while LQ letters require 114. To determine if the desired combination will fit, use the formula:

(# of draft characters×30)+(# of LQ characters×114)$\leqq$18,432

For example: 128 draft and 128 letter quality are desired.
(128×30)+(128×114)=3,840+14,592=18,432, therefore this combination will fit.

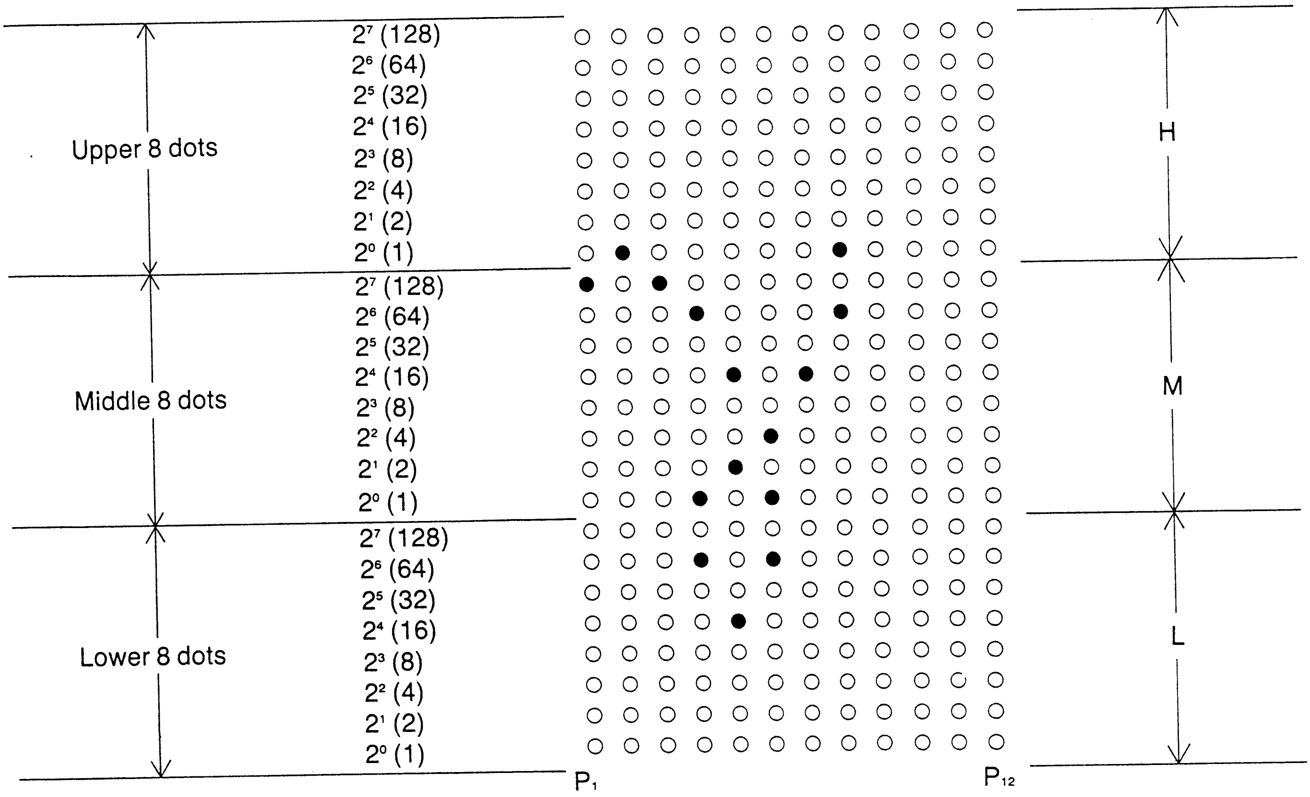
Because no more than 256 addresses can be identified in 1 byte (00_{HEX}-FF_{HEX}), 256 is the maximum of draft characters that can be defined. The maximum number of LQ characters that can be loaded is 161.

Defining Down Line Load Characters

1. Draft Font

To download a character, you must first design the character. A draft font download character uses 9 columns and 24 rows of dots. Since a given column contains 24 dots, each column is divided into 3 portions, upper 8, middle 8 and lower 8 dots. Column 1 is labeled P_{1H} for the upper 8 dots, P_{1M} for the middle 8 dots and P_{1L} for the lower 8 dots. Similarly column 9 is labeled P_{9H} for the upper 8 dots, P_{9M} for the middle 8 and P_{9L} for the lower 8 dots. Columns 10, 11 and 12 are always set to zero, thus we are working with P_{1H} through P_{9L}.

In the matrix below, the circles represent pins which may be fired. You may darken any circle provided no two adjacent horizontal circles are filled in. Once you have designed the character, you must quantify each dot column, P_{1H}–P_{9H}, by summing the powers of two represented by each dot. Consider the design of the Greek character gamma.


Upper 8 dots
Middle 8 dots
Lower 8 dots
2^7 (128)
2^6 (64)
2^5 (32)
2^4 (16)
2^3 (8)
2^2 (4)
2^1 (2)
2^0 (1)
H
M
L
P_1
P_{12}

$P_{1H}=0$
$P_{1M}=2^7=128$
$P_{1L}=0$
$P_{2H}=2^0=1$
$P_{2M}=0$
$P_{2L}=0$
$P_{3H}=0$
$P_{3M}=2^7=128$
$P_{3L}=0$

$P_{4H}=0$
$P_{4M}=2^6+2^0=65$
$P_{4L}=2^6=64$
$P_{5H}=0$
$P_{5M}=2^4+2^1=18$
$P_{5L}=2^4=16$
$P_{6H}=0$
$P_{6M}=2^2+2^0=5$
$P_{6L}=2^6=64$

$P_{7H}=0$
$P_{7M}=2^4=16$
$P_{7L}=0$
$P_{8H}=2^0=1$
$P_{8M}=2^6=64$
$P_{8L}=0$
$P_{9H}=0$
$P_{9M}=0$
$P_{9L}=0$

Input format for download command is:
LPRINT CHR\$(27)+"&"+CHR\$(0)+CHR\$(n)+CHR\$(m)+CHR\$(d_0)+CHR\$(d_1)+CHR\$(d_2)+data
Programming example is as follows:

```
10  REM Draft Download Character
20  LPRINT CHR$( 27 )+"x0";
30  LPRINT CHR$( 27 )+"&"+CHR$( 0 )+CHR$( 65 )+CHR$( 65 );
40  LPRINT CHR$( 0 )+CHR$( 8 )+CHR$( 4 );
50  LPRINT CHR$( 0 )+CHR$( 128 )+CHR$( 0 )+CHR$( 1 )+CHR$( 0 )+CHR$( 0 );
60  LPRINT CHR$( 0 )+CHR$( 128 )+CHR$( 0 )+CHR$( 0 )+CHR$( 65 )+CHR$( 64 );
70  LPRINT CHR$( 0 )+CHR$( 18 )+CHR$( 16 )+CHR$( 0 )+CHR$( 5 )+CHR$( 64 );
80  LPRINT CHR$( 0 )+CHR$( 16 )+CHR$( 0 )+CHR$( 1 )+CHR$( 64 )+CHR$( 0 );
90  REM Download Character print
100 LPRINT CHR$( 27 )+"%"+CHR$( 1 );
110 LPRINT "A A A A A"
120 LPRINT CHR$( 27 )+"%"+CHR$( 0 );
130 END
    YYYYY
```

Program line 20 is necessary for downloading draft font and designates draft printing.

Next you determine where in RAM the character(s) should be stored. The variables "n" and "m" are used for this purpose. The value specified for "n" indicates the location into which the first download character will be stored. If you are storing a single character, then n=m.
We must next define the value of "d_0", "d_1" and "d_2" which specifies attribute information. The attribute information includes the following:

d_0=number of space dot columns to the left of the character body
d_1=number of character body dot columns
d_2=number of space dot columns to the right of the character body

In our sample program, we create gamma character. This character consists of no left space dot columns, 8 body dot columns and 4 right space dot columns 9, 10, 11, 12. Therefore,

$d_0=0$, $d_1=8$ and $d_2=4$.

The combinations of d_0, d_1 and d_2 are as follows:

	d_1 (Maximum)	$d_0+d_1+d_2$
Draft	9	12
LQ	37	—

The number of printable dots for characters downloaded in the letter quality font is as follows:

	$d_0+d_1+d_2$
LQ 10 cpi	36
LQ 12 cpi	30
Proportional Spacing	—

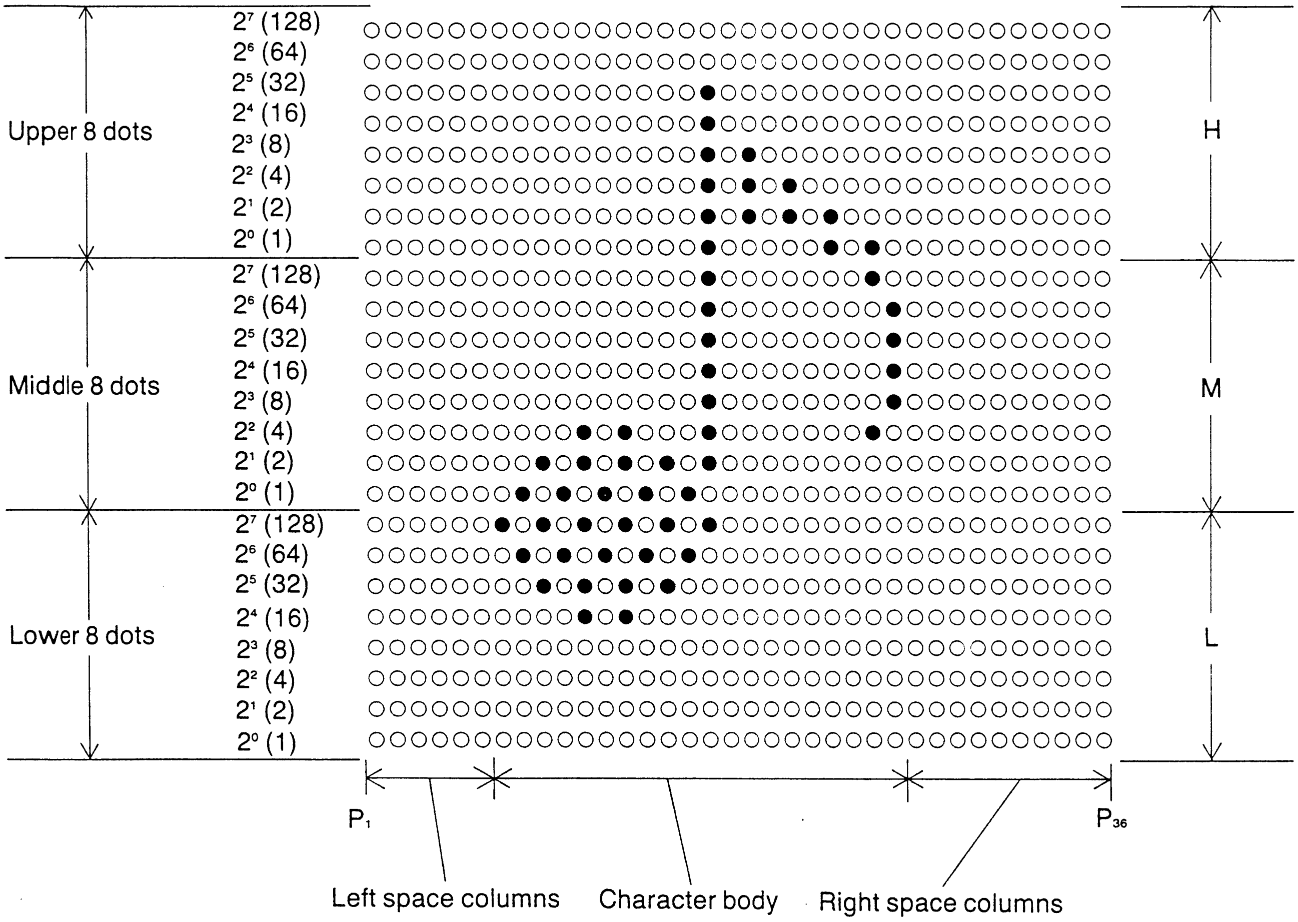
Program lines 40–80, therefore, use the eight values P_{1H}–P_{8L} to define the shape and size of gamma.

Note: Although two horizontal adjacent columns cannot be printed in draft and letter quality printing mode, in text printing mode any dot position can be printed.

Program line 100 selects download character generator. After this selection, by printing the download code (in this example, CHR$(65)="A") downloadable font is printed.

2. LQ Font

Designing and storing fonts can be performed in the same way as with draft fonts. Here, only a sample is shown as follows:


Upper 8 dots
Middle 8 dots
Lower 8 dots
2⁷ (128)
2⁶ (64)
2⁵ (32)
2⁴ (16)
2³ (8)
2² (4)
2¹ (2)
2⁰ (1)
H
M
L
P1
P36
Left space columns
Character body
Right space columns

$P_{7H}=0$
$P_{7M}=0$
$P_{7L}=128$
$P_{8H}=0$
$P_{8M}=1$
$P_{8L}=64$
$P_{9H}=0$
$P_{9M}=2$
$P_{9L}=160$
$P_{10H}=0$
$P_{10M}=1$
$P_{10L}=64$

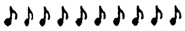
$P_{11H}=0$
$P_{11M}=6$
$P_{11L}=176$
$P_{12H}=0$
$P_{12M}=1$
$P_{12L}=64$
$P_{13H}=0$
$P_{13M}=6$
$P_{13L}=176$
$P_{14H}=0$
$P_{14M}=1$
$P_{14L}=64$

$P_{15H}=0$
$P_{15M}=2$
$P_{15L}=160$
$P_{16H}=0$
$P_{16M}=1$
$P_{16L}=64$
$P_{17H}=63$
$P_{17M}=254$
$P_{17L}=128$
$P_{18H}=0$
$P_{18M}=0$
$P_{18L}=0$

$P_{19H}=14$
$P_{19M}=0$
$P_{19L}=0$
$P_{20H}=0$
$P_{20M}=0$
$P_{20L}=0$
$P_{21H}=6$
$P_{21M}=0$
$P_{21L}=0$
$P_{22H}=0$
$P_{22M}=0$
$P_{22L}=0$

$P_{23H}=3$
$P_{23M}=0$
$P_{23L}=0$
$P_{24H}=0$
$P_{24M}=0$
$P_{24L}=0$
$P_{25H}=1$
$P_{25M}=132$
$P_{25L}=0$
$P_{26H}=0$
$P_{26M}=120$
$P_{26L}=0$

```
10  REM Define Download Letter Quality Character
20  LPRINT CHR$(27)+"xl";
30  LPRINT CHR$(27)+":"+CHR$(0)+CHR$(0)+CHR$(0);
40  LPRINT CHR$(27)+"&"+CHR$(0)+CHR$(65)+CHR$(65);
50  LPRINT CHR$(6)+CHR$(20)+CHR$(10);
60  LPRINT CHR$(0)+CHR$(0)+CHR$(128)+CHR$(0)+CHR$(1)+CHR$(64);
70  LPRINT CHR$(0)+CHR$(2)+CHR$(160)+CHR$(0)+CHR$(1)+CHR$(64);
80  LPRINT CHR$(0)+CHR$(6)+CHR$(176)+CHR$(0)+CHR$(1)+CHR$(64);
90  LPRINT CHR$(0)+CHR$(6)+CHR$(176)+CHR$(0)+CHR$(1)+CHR$(64);
100 LPRINT CHR$(0)+CHR$(2)+CHR$(160)+CHR$(0)+CHR$(1)+CHR$(64);
110 LPRINT CHR$(63)+CHR$(254)+CHR$(128)+CHR$(0)+CHR$(0)+CHR$(0);
120 LPRINT CHR$(14)+CHR$(0)+CHR$(0)+CHR$(0)+CHR$(0)+CHR$(0);
130 LPRINT CHR$(6)+CHR$(0)+CHR$(0)+CHR$(0)+CHR$(0)+CHR$(0);
140 LPRINT CHR$(3)+CHR$(0)+CHR$(0)+CHR$(0)+CHR$(0)+CHR$(0);
150 LPRINT CHR$(1)+CHR$(132)+CHR$(0)+CHR$(0)+CHR$(120)+CHR$(0);
160 REM Download Character print
170 LPRINT CHR$(27)+"%"+CHR$(1);
180 LPRINT "A A A A A A A A A A"
190 LPRINT CHR$(27)+"%"+CHR$(0);
200 END
```



Print Mode Combination:

Draft Down Line Load characters can be printed only when the FONT and PITCH selectors are set to "Pgm".

Letter quality download character can be printed only when the FONT and PITCH selector switches are set to "Pgm" or the FONT selector switch is set to "LQ DLL".

5.2 Bit Image (Graphics)

Bit image (Graphics) is used to produce pictures, graphs, charts or creative patterns. Many commercial software packages use bit images. This printer has six 8-pin bit image modes and five 24-pin bit image modes, so that it can provide you with a wide variety of image printing. When you use a commercial software package you should refer to your software instruction manual for the proper use of it with this printer. Each printer mode has its own bit image commands. Although there are small differences among them, LQ-1500 printer mode is used here as an example of how to print bit images through software commands.

Dot Density

Dot density (dot resolution) refers to the maximum number of dots which can be printed in an inch or on a line. This printer enables you to access a variety of dot densities through specific control commands. The various dot densities and corresponding control commands appear in Table 5.1.

Command	Function	Dots/inch	Dots/line
ESC+K+n_1+n_2	Standard density	60	816
ESC+L+n_1+n_2	Double density	120	1632
ESC+Y+n_1+n_2	Double speed, Double density	120	1632
ESC+Z+n_1+n_2	Quadruple density	240	3264
ESC+*+m+n_1+n_2	8-Pin Mode Selection:		
	m=0 (Standard)	60	816
	m=1 (Double)	120	1632
	m=2 (Double speed, Double density)	120	1632
	m=3 (Quadruple density)	240	3264
	m=4 (CRT I)	80	1088
	m=6 (CRT II)	90	1224
	24-Pin Mode Selection:		
	m=32 (Standard)	60	816
	m=33 (Double)	120	1632
	m=38 (CRT III)	90	1224
	m=39 (Triple)	180	2448
	m=40 (Hex)	360	4896
ESC+?+n+m	Bit Image Mode Reassignment:		
	n=“K”, “L”, “Y”, “Z”		
	m=0 (Standard)	60	816
	m=1 (Double)	120	1632
	m=2 (Double speed, Double density)	120	1632
	m=3 (Quadruple density)	240	3264
	m=4 (CRT I)	80	1088
	m=6 (CRT II)	90	1224
	m=32 (Standard)	60	816
	m=33 (Double)	120	1632
	m=38 (CRT III)	90	1224
	m=39 (Triple)	180	2448
	m=40 (Hex)	360	4896

Table 5.1 Dot Density

8-Pin Bit Image Mode

This printer has 24 pins in the print head. The distance between the centers of adjacent pins is $\frac{1}{180}''$ (0.14 mm) and the diameter of each pin is $\frac{1}{127}''$ (0.2 mm). In 8-pin bit image mode the 24 pins of the print head are grouped into eight pin-blocks of three pins each (pin-block 8 is at the bottom, pin-block 1 is at the top). One byte is sent to the printer for each column to be printed. Each bit of that byte represents an individual pin-block. By summing the powers of two corresponding to each pin-block you wish to fire, you will obtain a numerical value for the column in question. By sending a string of bytes, numerical values for each column on a line are input and processed. The result is one line of graphics.

Pin-block	Pin-block Code	Pins	Pin No.
1	$2^7=128$	• • •	1 2 3
2	$2^6=64$	• • •	4 5 6
3	$2^5=32$	• • •	7 8 9
4	$2^4=16$	• • •	10 11 12
5	$2^3=8$	• • •	13 14 15
6	$2^2=4$	• • •	16 17 18
7	$2^1=2$	• • •	19 20 21
8	$2^0=1$	• • •	22 23 24

As an example, suppose you want to fire pin-blocks 1, 2, 5 and 8 simultaneously. Then you complete the following sum:

Input code=Pin-block 1 code+Pin-block 2 code+Pin-block 5 code+Pin-block 8 code
$=2^7+2^6+2^3+2^0$
$=128+64+8+1$
$=201$

Thus, the value 201 is entered in the CHR$ function in order to print a single column of dots resulting from firing pin-blocks 1, 2, 5 and 8.

For our final example, refer to the standard density designation in Table 5.1. This setting is given by ESC+K+n_1+n_2. Suppose you wish to print 100 columns of dots, where every column fires pins 1 and 8 only.

You first compute the values of n_1 and n_2 which define the number of columns to be printed.

$$\begin{array}{r|l} & \quad 0\ (n_2) \\ \hline 256) & \ 100 \\ & \quad\ \underline{0\quad\ } \\ & \ 100\ (n_1) \end{array}$$

, so $n_2=0$ and $n_1=100$

Our control code ESC+K+n_1+n_2 now translates into:

LPRINT CHR$(27)+"K"+CHR$(100)+CHR$(0);

Next compute the code for firing pins 1 and 8 simultaneously:

Input Code=Pin 1 Code+Pin 8 Code
$=2^7+2^0$
$=128+1$
$=129$

Finally, we incorporate our two calculations into the following program. Note that lines 20 and 30 are necessary for the proper execution of this program on many IBM-compatible computers.
Such BASIC statements suppress CR and LF codes and enable printing on a full line without unwanted "breaks". Programs which include statements such as lines 20 and 30 cannot use LPRINT to print data. In such cases, PRINT# statements must be used. Line 90 is necessary to CLOSE all open files.

```
10  REM STANDARD DENSITY
20  WIDTH "LPT1:",255
30  OPEN "LPT1:" AS #1
40  PRINT#1,CHR$(27)+"K"+CHR$(100)+CHR$(0);
50  FOR I=1 TO 100
60  PRINT#1,CHR$(129);
70  NEXT I
80  PRINT#1,CHR$(10);
90  CLOSE
100 END
```

24-Pin Bit Image Mode

In the 24-pin bit image mode, all 24 pins of the print head may be fired. In this mode, 3 data bytes must be sent to the printer for each column. The 24 pins in the print head are divided into three portions, the upper 8 pins, middle 8 pins and lower 8 pins.
As an example, suppose you want to fire pins 1, 2, 5, 8, 9, 11, 12, 21 and 24 simultaneously. Then you determine the following three values:

Byte 1: Input code=Pin 1 code+Pin 2 code+Pin 5 code+Pin 8 code
$=2^7+2^6+2^3+2^0$
$=128+64+8+1=201$

Byte 2: Input code=Pin 9 code+Pin 11 code+Pin 12 code
$=2^7+2^5+2^4$
$=128+32+16=176$

Byte 3: Input code=Pin 21 code+Pin 24 code
$=2^3+2^0$
$=8+1=9$

Thus, the three bytes for a single column of dots are entered as CHR$(201);CHR$(176);CHR$(9);
Refer to the 24-pin standard density command in Table 5-1. This setting is given by ESC+*+m+n_1+n_2, where m=32. Suppose you wish to print 100 columns of dots, where every column fires pins 1, 2, 5, 8, 9, 11, 12, 21 and 24 as above.
As in the 8-pin example on page 5-7, $n_1=100$ and $n_2=0$. Our control code ESC+*+m+n_1+n_2 now translates into LPRINT CHR$(27)+“ * ”+CHR$(32)+CHR$(100)+CHR$(0);.
If we incorporate this information into a program, we might have the following:

```
10  REM 24 PIN STANDARD DENSITY
20  WIDTH "LPT1:",255
30  OPEN "LPT1:" AS #1
40  PRINT#1,CHR$(27)+"*"+CHR$(32)+CHR$(100)+CHR$(0);
50  FOR I=1 TO 100
60  PRINT#1,CHR$(201);
70  PRINT#1,CHR$(176);
80  PRINT#1,CHR$(9);
90  NEXT I
100 PRINT#1,CHR$(10);
110 CLOSE
120 END
```

Before proceeding with examples of each graphics control command, three important points are worth noting.

First, bit image graphics automatically sets the printer to single direction (left to right) printing. This is done to ensure that dots are correctly aligned vertically.

Second, the graphics mode is released immediately following the printing of all bit image data. Printing will return to the text mode.

Third, any bit image data are not affected by MSB control commands.

6. Epson LQ-1500 Mode Commands

This chapter covers software commands of Epson LQ-1500 mode. The software commands are grouped into the following classifications:

- **Font Selection**
- **Character Pitch Selection**
- **Character Highlight Selection**
- **Character Set Selection**
- **Bit Image (Graphics) Mode Selection**
- **Paper Feed Control**
- **Page Format Control**
- **Tabulation**
- **Carriage Control**
- **Data Control**
- **Down Line Load Character Selection**
- **Miscellaneous**

FONT SELECTION

Name	Function	Page
ESC+4	Selects Italic printing	6-6
ESC+5	Releases Italic printing	6-6
ESC+x+n	Selects print quality	6-6
ESC+k+n	Selects print font style	6-6
ESC+S+0	Selects superscript printing	6-7
ESC+S+1	Selects subscript printing	6-7
ESC+T	Releases sub/superscript printing	6-7

CHARACTER PITCH SELECTION

Name	Function	Page
ESC+P	Sets 10 cpi (pica pitch) printing	6-7
ESC+M	Sets 12 cpi (elite pitch) printing	6-8
ESC+g	Sets 15 cpi (Micron) printing	6-8
SI	Sets 17 cpi (compressed) printing	6-8
ESC+SI	Sets 17 cpi (compressed) printing	6-8
DC2	Releases compressed printing	6-8
ESC+p+1	Sets proportional spacing	6-9
ESC+p+0	Releases proportional spacing	6-9
ESC+SP+n	Sets character dot spacing	6-9
ESC+!+n	Sets certain pitches based upon value of n	6-9

CHARACTER HIGHLIGHT SELECTION

Name	Function	Page
ESC+E	Sets emphasis printing	6-10
ESC+F	Releases emphasis printing	6-10
ESC+G	Sets double printing	6-10
ESC+H	Releases double printing	6-10
SO	Sets single-line double width printing	6-10
DC4	Releases single-line double width printing	6-10
ESC+SO	Sets single-line double width printing	6-10
ESC+W+1	Sets double width printing	6-11
ESC+W+0	Releases double width printing	6-11
ESC+−+1	Sets underlining	6-11
ESC+−+0	Releases underlining	6-11
ESC+!+n	Sets highlighting based upon value of n	6-9

CHARACTER SET SELECTION

Name	Function	Page
ESC+R+n	Sets international character set	6-11
ESC+6	Enables printable characters (80H~9FH)	6-12
ESC+7	Releases printable characters (80H~9FH)	6-12
ESC+t+n	Selects alternate character set	6-12

BIT IMAGE (GRAPHICS) MODE SELECTION

Name	Function	Page
ESC+K+n_1+n_2	Sets 8 pin image standard density (60 dots/inch)	6-13
ESC+L+n_1+n_2	Sets 8 pin image double density (120 dots/inch)	6-13
ESC+Y+n_1+n_2	Sets 8 pin image double density/double speed (120 dots/inch)	6-13
ESC+Z+n_1+n_2	Sets 8 pin bit image quadruple density (240 dots/inch)	6-13
ESC+*+m+n_1+n_2	Sets bit image mode selection (8 pin 60,120,120D,240,80,90, 24 pin 60,120,90,180,360)	6-14
ESC+?+n+m	Reassigns graphics mode density	6-14

PAPER FEED SELECTION

Amount

Name	Function	Page
ESC+0	Sets paper feed to 1/8 inch (3.2 mm)	6-15
ESC+2	Sets paper feed to 1/6 inch (4.2 mm)	6-15
ESC+A+n	Sets paper feed to n/60 inch	6-15
ESC+3+n	Sets paper feed to n/180 inch	6-15

Execution

Name	Function	Page
LF	Feeds paper one line	6-16
FF	Feeds paper to next top of form position	6-16
ESC+J+n	Executes one-line paper feed of n/180 inch	6-17
ESC+j+n	Executes one-line reverse paper feed of n/180 inch	6-17
ESC+f+1+n	Feeds paper "n" lines	6-18

PAGE FORMAT CONTROL

Name	Function	Page
ESC+C+0+n	Sets page length in inches	6-18
ESC+C+n	Sets page length in lines	6-18
ESC+l+n	Sets left margin	6-19
ESC+Q+n	Sets right margin	6-19
ESC+N+n	Sets skip perforation	6-20
ESC+O	Releases skip perforation	6-20

TABULATION

Horizontal

Name	Function	Page
ESC+D+n_1...+n_x+0	Sets horizontal tab	6-20
ESC+D+0	Releases horizontal tab	6-20
ESC+e+0+n	Sets horizontal tab every "n" position	6-21
HT	Executes horizontal tab	6-21

Vertical

Name	Function	Page
ESC+B+n_1+...+n_x+0	Sets vertical tab	6-22
ESC+B+0	Releases vertical tab	6-22
ESC+e+1+n	Sets vertical tab every "n" lines	6-22
VT	Executes vertical tab	6-22
ESC+/+n	Sets VFU channel	6-23
ESC+b+m+n_1+...+n_x+0	Sets VFU tabulation	6-23
ESC+b+m+0	Releases VFU tabulation	6-23

CARRIAGE CONTROL

Name	Function	Page
ESC+h+1	Sets 12 cpi High Speed Mode	6-23
ESC+h+0	Releases 12 cpi High Speed Mode	6-23
BS	Prints, then backspaces one character	6-24
CR	Prints a line, then returns carriage	6-24
ESC+<	Homes the print head	6-24
ESC+U+1	Sets single direction printing	6-24
ESC+U+0	Releases single direction printing	6-24
ESC+s+1	Sets half speed printing	6-25
ESC+s+0	Releases half speed printing	6-25
ESC+f+0+n	Skips "n" position on a line	6-25
ESC+\+n_1+n_2	Moves the printhead to a relative horizontal position	6-25
ESC+$+$n_1$+$n_2$	Moves the printhead to an absolute horizontal position	6-26

DATA CONTROL

Name	Function	Page
CAN	Clears data in buffer	6-26
DC1	Selects printer remotely	6-26
DC3	Deselects printer remotely	6-27
DEL	Deletes last printable character	6-27
ESC+>	Sets MSB on	6-27
ESC+=	Sets MSB off	6-28
ESC+#	Cancels MSB setting	6-28
ESC+V+n	Repeats data n times	6-29
ESC+V+0	Defines end of data	6-29

DOWN LINE LOAD CHARACTER SELECTION

Name	Function	Page
ESC+&+0+n+m	Defines download font	6-29
ESC+%+0	Selects ROM CG	6-29
ESC+%+1	Selects download CG	6-29
ESC+:+0+0+0	Copies internal ROM CG font into download CG	6-30

MISCELLANEOUS

Name	Function	Page
BEL	Sounds the buzzer	6-30
ESC	First byte of multi-byte control codes	6-30
NUL	Last byte of certain multi-byte control codes	6-30
ESC+@	Initializes the printer	6-31
ESC+9	Enables paper-out detection	6-31
ESC+8	Disables paper-out detection	6-31

ITALIC FONT:

Selects italic character printing.

Name:	Setting:	ESC+4	
	Release:	ESC+5	
Code:	Setting:	27,52 DEC	1B,34 HEX
	Release:	27,53 DEC	1B,35 HEX
Input Format:	Setting:	LPRINT CHR$(27)+"4" ;	
	Release:	LPRINT CHR$(27)+"5" ;	

Comments:

- Italic characters can be printed in the letter quality font and in proportional spacing.
- Italic characters in locations 160 DEC–254 DEC (A0 HEX–FE HEX) are printed in place of characters in locations 32 DEC–126 DEC (20 HEX–7E HEX).
- Italic setting command is ineffective in 12HS mode.

LETTER QUALITY (LQ) FONT:

Selects letter quality font printing.

Name:	LQ Setting:	ESC+x+n		n=1,49,129,177
	Release (Draft):	ESC+x+m		m=0,48,128,176
Code:	LQ Setting:	27,120,n DEC	1B,78,n HEX	
	Release (Draft):	27,120,m DEC	1B,78,m HEX	
Input Format:	Setting:	LPRINT CHR$(27)+"x"+CHR$(n) ;		
	Release:	LPRINT CHR$(27)+"x"+CHR$(m) ;		

Comments:

- This command sets letter quality printing in whichever pitch is set at the time.
- Sub/superscript characters can be printed in the letter quality font.
- Fonts are set as follows:
  m=0: Draft font
  n=1: LQ font
- This command is operational only when the FONT and PITCH selector switches are set to "Pgm".

FONT STYLE

Selects font style.

Name:	ESC+k+n	n=0,1,2,3
Code:	27,107,n DEC	1B,6B,n HEX
Input Format:	LPRINT CHR$(27)+"k"+CHR$(n);	

Comment:

- The following values can be used.

n=0: Draft Font
n=1: Text Font
n=2: Courier Font
n=3: Option LQ Font

SUPERSCRIPT FONT:

Selects superscript font with characters printed on the top ⅔ area of the line. Characters are reduced to ⅔ their original height.

Name: Setting: ESC+S+n n=0,48,128,176
Release: ESC+T

Code: Setting: 27,83,n DEC 1B,53,n HEX
Release: 27,84 DEC 1B,54 HEX

Input Format: Setting: LPRINT CHR$(27)+"S"+CHR$(n) ;
Release: LPRINT CHR$(27)+"T";

Comments:

- Superscript characters are normal width.
- Superscript characters can be printed in the letter quality mode.
- In the letter quality mode, characters are reduced to ⅔ their original width.
- ESC+T also releases the subscript print setting.

SUBSCRIPT FONT:

Selects subscript font with characters printed on the bottom ⅔ area of the line. Characters are reduced to ⅔ their original height.

Name: Setting: ESC+S+m m=1,49,129,177
Release: ESC+T

Code: Setting 27,83,m DEC 1B,53,m HEX
Release: 27,84 DEC 1B,54 HEX

Input Format: Setting: LPRINT CHR$(27)+"S"+CHR$(m);
Release: LPRINT CHR$(27)+"T";

Comments:

- Subscript characters are normal width.
- Subscript characters can be printed in the letter quality mode.
- In the letter quality mode, characters are reduced to ⅔ their original width.
- ESC+T also releases the superscript print setting.

PICA PITCH:

Sets pica pitch (10 characters per inch) printing.

Name: ESC+P

Code: 27,80 DEC 1B,50 HEX

Input Format: LPRINT CHR$(27)+"P" ;

Comments:

- Setting pica pitch produces 10 characters per inch or 136 characters per line.
- Pica pitch can be changed to elite, proportional, compressed, etc. by entering the appropriate control commands.
- If ESC+P is executed after proportional spacing has been set, font is printed using proportional spacing.
- This command is operational only when the FONT and PITCH selector switches are set to "Pgm".

ELITE PITCH:

Sets elite pitch (12 characters per inch) printing.

Name: ESC+M

Code: 27,77 DEC 1B,4D HEX

Input Format: LPRINT CHR$(27)+"M" ;

Comments:

- Setting elite pitch produces 12 characters per inch or 163 characters per line.
- Proportional spacing cannot be printed using the elite pitch. When proportional spacing and elite pitch printing are set simultaneously, subsequent output is printed using in pica pitch and proportional spacing.
- This command is operational only when the FONT and PITCH selector switches are set to "Pgm".

MICRON PRINTING:

Sets micron (15 characters per inch) printing.

Name: ESC+g

Code: 27,103 DEC 1B,67 HEX

Input Format: LPRINT CHR$(27)+"g";

Comments:

- Setting micron produces 15 characters per inch or 204 characters per line.
- This command is operational only when the FONT and PITCH selector switches are set to "Pgm".

COMPRESSED PITCH:

Sets compressed pitch (17 characters per inch) printing.

Name:
Setting: SI or ESC+SI
Release: DC2

Code:
Setting: 15 or 27,15 DEC 0F or 1B,0F HEX
Release: 18 DEC 12 HEX

Input Format:
Setting: LPRINT CHR$(15);
or
LPRINT CHR$(27)+CHR$(15) ;
Release: LPRINT CHR$(18);

Comments:

- Setting compressed pitch produces 17 characters per inch or 233 characters per line.
- This command is operational only when the FONT and PITCH selector switches are set to "Pgm".
- When 12, 15 cpi or proportional spacing and compressed pitch are set simultaneously, the compressed print setting will be ignored.

PROPORTIONAL SPACING:

Sets proportional spacing between characters.

Name:	Setting:	ESC+p+n	n=1,49,129,177
	Release:	ESC+p+m	m=0,48,128,176
Code:	Setting:	27,112,n DEC	1B,70,n HEX
	Release:	27,112,m DEC	1B,70,m HEX
Input Format:	Setting:	LPRINT CHR$(27)+"p"+CHR$(n) ;	
	Release:	LPRINT CHR$(27)+"p"+CHR$(m) ;	

Comments:

- If proportional spacing is set together with pica, elite, micron or compressed pitch, subsequent output is printed in pica pitch and proportional spacing.
- This command is operational only when the FONT and PITCH selector switches are set to "Pgm".

CHARACTER DOT SPACING:

Sets character dot spacing.

Name:	ESC+SP+n	0≦n≦127
Code:	27,32,n DEC	1B,20,n HEX
Input Format:	LPRINT CHR$(27)+CHR$(32)+CHR$(n);	

Comments:

- Set the amount of dot space (Draft: n/120 inch, LQ: n/180 inch) added to the right of each character.
- This command allows microjustification on a line by line basis.

PROGRAMMABLE PITCH/HIGHLIGHTING:

Sets a combination of character pitch and/or highlighting.

Name:	ESC+!+n	0≦n≦255
Code:	27,33,n DEC	1B,21,n HEX
Input Format:	LPRINT CHR$(27)+"!"+CHR$(n) ;	

Comments:

- Print modes correspond to the setting of each bit as illustrated below.

bit	7	6	5	4	3	2	1	0
"1"	Under-lining	Italic	Double width	Double printing	Empha-sized	Compres-sed	P S	Elite
"0"	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Pica

- Bits 0, 1 and 2 only pertain to pitch.
- If n=49 (31 HEX), bits 0,4 and 5 are set to "1" producing double width, elite, double printing.
- Pitch and highlight combinations are determined by the value of "n".
- Compressed, pica, elite and proportional spacing pitch are operational only when the FONT and PITCH selector switches are set to "Pgm".

EMPHASIS PRINTING:

Sets printing to twice the original horizontal dot density.

Name:	Setting:	ESC+E	
	Release:	ESC+F	
Code:	Setting:	27,69 DEC	1B,45 HEX
	Release:	27,70 DEC	1B,46 HEX
Input Format:	Setting:	LPRINT CHR$(27)+"E" ;	
	Release:	LPRINT CHR$(27)+"F" ;	

Comment:

- Emphasized characters are printed at half speed (100 characters per second in draft pica pitch).

DOUBLE PRINTING

Sets printing of each line of data with two passes of the print head, feeding the paper 1/180" (0.14 mm) between the first and second pass.

Name:	Setting:	ESC+G	
	Release:	ESC+H	
Code:	Setting:	27,71 DEC	1B,47 HEX
	Release:	27,72 DEC	1B,43 HEX
Input Format:	Setting:	LPRINT CHR$(27)+"G";	
	Release:	LPRINT CHR$(27)+"H";	

DOUBLE WIDTH PRINTING—SINGLE LINE:

Sets double width (elongated) character printing for one line only.

Name:	Setting:	SO or ESC+SO	
	Release:	DC4 or ESC+W+m	m=0,48,128,176
Code:	Setting:	14 or 27,14 DEC	0E or 1B, 0E HEX
	Release 1:	20 DEC	14 HEX
	Release 2:	27,87,m DEC	1B,57,m HEX
Input Format:	Setting:	LPRINT CHR$(14); or LPRINT CHR$(27)+CHR$(14);	
	Release 1:	LPRINT CHR$(20);	
	Release 2:	LPRINT CHR$(27)+"W"+CHR$(m);	

Comment:

- Single-line double width printing is released when:
  - —a CR, LF, FF or VT is executed.
  - —the printer is initialized.
  - —DC4 or ESC+W+m is executed.
  - —ESC+!+0 is executed.

DOUBLE WIDTH PRINTING:

Sets double width (elongated) character printing.

Name:	Setting:	ESC+W+n	n=1,49,129,177
	Release:	ESC+W+m	m=0,48,128,176
Code:	Setting:	27,87,n DEC	1B,57,n HEX
	Release:	27,87,m DEC	1B,57,m HEX
Input Format:	Setting:	LPRINT CHR$(27)+"W"+CHR$(n) ;	
	Release:	LPRINT CHR$(27)+"W"+CHR$(m) ;	

Comment:

- Double width printing set by ESC+W+n is only released by ESC+W+m or ESC+!+0.

UNDERLINING:

Sets continuous underlining of characters.

Name:	Setting:	ESC+−+n	n=1,49,129,177
	Release:	ESC+−+m	m=0,48,128,176
Code:	Setting:	27,45,n DEC	1B,2D,n HEX
	Release:	27,45,m DEC	1B,2D,m HEX
Input Format:	Setting:	LPRINT CHR$(27)+"−"+CHR$(n) ;	
	Release:	LPRINT CHR$(27)+"−"+CHR$(m) ;	

Comments:

- Bit image data and spaces set by the HT code, spaces set by the ESC+f+0+n, IBM graphics characters are not underlined.
- Whenever two passes of the print head are required, underline is printed only on the first pass.

INTERNATIONAL CHARACTER SET:

Selects any one of 11 international character sets.

Name:	ESC+R+n	0≦n≦10
Code:	27,82,n DEC	1B,52,n HEX
Input Format:	LPRINT CHR$(27)+"R"+CHR$(n) ;	

Comments:

- Appendix A illustrates allocation of international characters to their respective locations.
- International character sets 0–7 can be set with DIP switches 1-5, -6 and -7.
- Character sets 8, 9, and 10 may be accessed through software ONLY.

IBM CHARACTER SET I:

Selects IBM Proprinter character set 1.

Name: ESC+7

Code: 27,55 DEC 1B,37 HEX

Input Format: LPRINT CHR$(27)+"7" ;

Comments:
- Refer to Appendix A.
- This command is operational only when IBM Graphics is selected by ESC+t+n.

IBM CHARACTER SET II:

Selects IBM Proprinter character set 2.

Name: ESC+6

Code: 27,54 DEC 1B,36 HEX

Input Format: LPRINT CHR$(27)+"6" ;

Comments:
- Refer to Appendix A.
- This command is operational only when IBM Graphics is selected by ESC+t+n.

ALTERNATE CHARACTER SET:

Selects alternate character set.

Name: ESC+t+n n=0,1,2

Code: 27,83,n DEC 1B,53,n HEX

Input Format: LPRINT CHR$(27)+"t"+CHR$(n);

Comment:
- The following values of n can be used.

n=0: Italic
n=1: IBM Character Set 1
n=2: IBM Character Set 2

8-PIN STANDARD DENSITY GRAPHICS:

Sets standard density graphics mode (816 dots per line/60 dots per inch (25.4 mm)).

Name: ESC+K+n_1+n_2

Code: 27,75,n_1,n_2 DEC 1B,4B,n_1,n_2 HEX

Input Format: `LPRINT CHR$(27)+"K"+CHR$(n1)+CHR$(n2) ;`

8-PIN DOUBLE DENSITY GRAPHICS:

Sets double density graphics mode (1632 dots per line/120 dots per inch (25.4 mm)).

Name: ESC+L+n_1+n_2

Code: 27,76,n_1,n_2 DEC 1B,4C,n_1,n_2 HEX

Input Format: `LPRINT CHR$(27)+"L"+CHR$(n1)+CHR$(n2) ;`

8-PIN DOUBLE SPEED, DOUBLE DENSITY GRAPHICS:

Sets double speed, double density graphics mode (1632 dots per line/120 dots per inch (25.4 mm)).

Name: ESC+Y+n_1+n_2

Code: 27,89,n_1,n_2 DEC 1B,59,n_1,n_2 HEX

Input Format: `LPRINT CHR$(27)+"Y"+CHR$(n1)+CHR$(n2) ;`

Comment:

- Horizontally adjacent dots cannot be printed.

8-PIN QUADRUPLE DENSITY GRAPHICS:

Sets quadruple density graphics mode (3264 dots per line/240 dots per inch (25.4 mm)).

Name: ESC+Z+n_1+n_2

Code: 27,90,n_1,n_2 DEC 1B,5A,n_1,n_2 HEX

Input Format: `LPRINT CHR$(27)+"Z"+CHR$(n1)+CHR$(n2) ;`

Comment:

- Horizontally adjacent dots cannot be printed.

BIT IMAGE MODE SELECTION:

Selects one of 8-pin and 24-pin bit image graphic modes.

Name: ESC+*+m+n_1+n_2+DATA m=0,1,2,3,4,6,32,33,38,39,40

Code: 27,42,m,n_1,n_2,DATA DEC 1B,2A,m,n_1,n_2,DATA HEX

Input Format: LPRINT CHR$(27)+"*"+CHR$(m)+CHR$($n_1$)+CHR$(n_2)+DATA;

Comments:

- The following table illustrates the various modes based upon the values of m.

m	Pin	Dots/Inch	Dots/Line	
0	8	60	816	Standard Density
1	8	120	1632	Double Density
2	8	120	1632	Double Speed, Double Density
3	8	240	3264	Quadruple Density
4	8	80	1088	CRT I
6	8	90	1224	CRT II
32	24	60	816	Standard Density
33	24	120	1632	Double Density
38	24	90	1224	CRT III
39	24	180	2448	Triple Density
40	24	360	4896	Hex Density

- When m=2,3,40, Horizontal adjacent dots cannot be printed.

BIT IMAGE MODE REASSIGNMENT:

Reassigns bit image graphics mode density.

Name: ESC+?+n+m n=75,76,89,90
m=0,1,2,3,4,6,32,33,38,39,40

Code: 27,63,n,m DEC 1B,3F,n,m, HEX

Input Format: LPRINT CHR$(27)+"?"+CHR$(n)+CHR$(m) ;

Comments:

- The value of "n" specifies the graphics mode which is to be reassigned:
  n=75: Reassign STANDARD DENSITY (ESC+K+n_1+n_2)
  n=76: Reassign DOUBLE DENSITY (ESC+L+n_1+n_2)
  n=89: Reassign DOUBLE SPEED, DOUBLE DENSITY (ESC+Y+n_1+n_2)
  n=90: Reassign QUADRUPLE DENSITY (ESC+Z+n_1+n_2)
- The value of "m" specifies the graphics mode to which the original is to be reassigned. Refer to Table 5.1.

⅛ INCH PAPER FEED:

Sets paper feed amount to ⅛ inch (3.2 mm).

Name: ESC+0

Code: 27,48 DEC 1B,30 HEX

Input Format: LPRINT CHR$(27)+"0" ;

Comment:

- The paper feed amount is not exactly ⅛ inch, for the minimum unit is $^{1}/_{180}$ inch.

⅙ INCH PAPER FEED:

Sets paper feed amount to ⅙ inch (4.2 mm).

Name: ESC+2

Code: 27,50 DEC 1B,32 HEX

Input Format: LPRINT CHR$(27)+"2";

$^{n}/_{60}$ INCH PAPER FEED:

Sets programmable paper feed amount to $^{n}/_{60}$ inch.

Name: ESC+A+n

Code: 27,65,n DEC 1B,41,n HEX

Input Format: LPRINT CHR$(27)+"A"+CHR$(n) ;

Comment:

- $^{n}/_{60}$ inch paper feed is valid for $0 \leqq n \leqq 85$.

$^{n}/_{180}$ INCH PAPER FEED:

Sets programmable paper feed amount to $^{n}/_{180}$ inch.

Name: ESC+3+n

Code: 27,51,n DEC 1B,33,n HEX

Input Format: LPRINT CHR$(27)+"3"+CHR$(n) ;

Comment:

- $^{n}/_{180}$ inch paper feed is valid for $0 \leqq n \leqq 255$.

LINE FEED (LF):

Causes data in buffer to be printed and then executes a single line feed.

Name: LF

Code: 10 DEC 0A HEX

Input Format: LPRINT CHR$(10) ;

Comments:

- When the new line position falls within the perforation skip area, the paper advances to the next top of form position.
- If there is no data, "space" data (ASCII 32), or blanks between HT print positions in the buffer, LF feeds the paper by only 1 line.
- The amount of spacing generated by LF is a function of the paper feed amount setting.
- LF code releases single-line double width printing set by SO.

FORM FEED (FF):

Feeds paper to next top of form position after first printing any data in the buffer.

Name: FF

Code: 12 DEC 0C HEX

Input Format: LPRINT CHR$(12) ;

Comments:

- FF releases single-line double width printing set by SO.
- Amount of form feed depends upon page length set by the page length control command.

$^n/_{180}$ INCH PAPER FEED:

Prints out the data in the print buffer and feeds the paper $^n/_{180}$ inch.

Name: ESC+J+n

Code: 27,74,n DEC 1B,4A,n HEX

Input Format: LPRINT CHR$(27)+"J"+CHR$(n) ;

Comments:

- Single-line, $^n/_{180}$ inch paper feed is valid for 0≦n≦255.
- This command sets the paper feed for ONE line only. Subsequent paper feed returns to previous setting. However, the carriage does not return to the left margin position. Instead, printing of next line begins where previous printing left off.
- This command does not release single-line double width printing.

$^n/_{180}$ INCH REVERSE DIRECTION SINGLE LINE PAPER FEED:

Prints out the data in the print buffer and feeds the paper $^n/_{180}$ inch in reverse direction.

Name: ESC+j+n

Code: 27,106,n DEC 1B,6A,n HEX

Input Format: LPRINT CHR$(27)+"j"+CHR$(n);

Comments:

- Reverse, single line $^n/_{180}$ inch paper feed is valid for 0≦n≦255.
- This command sets reverse direction paper feed for one line only. Subsequent paper feed returns to the previous setting. The carriage will not return, however, to the left margin position. Instead, the printing of the next line begins where the previous printing left off.
- This command does not release single-line double width printing. ESC+j+n is effective in all printer modes.

Notes:

- Reverse paper feed cannot be executed in the area from the bottom perforation upward 3.6 inches (91.4 mm). Additionally, the perforation should not be included in the area of reverse paper feed.
- Multi-part forms should not be used with reverse paper feed.

n-LINE PAPER FEED:

Feeds the paper "n" lines after printing data in the buffer.

Name: ESC+f+1+n

Code: 27,102,1,n DEC 1B,66,01,n HEX

Input Format: LPRINT CHR$(27)+"f"+CHR$(1)+CHR$(n) ;

Comments:

- ESC+f+1+n uses the current paper feed amount and printing continues in the very next column where previous printing ended.
- The value of n must be in the range 0≦n≦127. If n≧128, the paper is fed n−128 lines.
- Programmable n-line paper feed does not release double width printing.

PAGE LENGTH (INCHES):

Sets page length in inches.

Name: ESC+C+0+n

Code: 27,67,0,n DEC 1B,43,00,n HEX

Input Format: LPRINT CHR$(27)+"C"+CHR$(0)+CHR$(n) ;

Comments:

- Upon receipt of ESC+C+0+n, the present line position becomes the top of page position.
- The value of n must be in the range 1≦n≦22.
- ESC+C+0+n releases the skip perforation settings.
- The page length does not change even if the paper feed amount is changed.
- The terms "form" and "page" are interchangeable.

PAGE LENGTH (LINES):

Sets page length in number of lines.

Name: ESC+C+n

Code: 27,67,n DEC 1B,43,n HEX

Input Format: LPRINT CHR$(27)+"C"+CHR$(n) ;

Comments:

- Upon receipt of ESC+C+n, the present line position becomes the top of page position.
- The value of n must be in the range 1≦n≦127. If n=0, page length returns to the inch designation.
- ESC+C+n releases the skip perforation settings.
- The page length does not change even if the paper feed amount is changed.
- The terms "form" and "page" are interchangeable.

LEFT MARGIN:

Sets position of left margin.

Name: ESC+l+n

Code: 27,108,n DEC 1B,6C,n HEX

Input Format: LPRINT CHR$(27)+"l"+CHR$(n) ;

Comments:

- If the value of n exceeds the right margin value, ESC+l+n is ineffective and the left margin does not change.
- Setting the left margin position clears all data in the print buffer.
- In proportional spacing, the left margin is set with pica pitch.
- Once the left margin position is set, a change in the character mode will not alter this left margin setting.
- Permissible values of "n" are given below.

PICA	0≦n≦134
ELITE	0≦n≦160
MICRON	0≦n≦201
Compressed	0≦n≦229

RIGHT MARGIN:

Sets position of right margin.

Name: ESC+Q+n

Code: 27,81,n DEC 1B,51,n HEX

Input Format: LPRINT CHR$(27)+"Q"+CHR$(n) ;

Comments:

- Permissible values of "n" are given below.

PICA	2≦n≦136
ELITE	3≦n≦163
MICRON	3≦n≦204
Compressed	4≦n≦233

- Any designation to the left of the left margin position is ignored.
- Setting the right margin clears all data in the buffer.
- In proportional spacing, the right margin is set with pica pitch.
- Once the right margin position is set, a change in the character mode will not alter this right margin setting.

SKIP PERFORATION:

Sets skip-over perforation.

Name: Setting: ESC+N+n
Release: ESC+O

Code: Setting: 27,78,n DEC 1B,4E,n HEX
Release: 27,79 DEC 1B,4F HEX

Input Format: Setting: LPRINT CHR$(27)+"N"+CHR$(n) ;
Release: LPRINT CHR$(27)+"O" ;

Comments:

- The value of n specifies the number of lines (or n times the current line spacing amount) to be skipped at the bottom of the page.
- This command is effective only for $1 \leqq n \leqq 127$. If $n \geqq 128$, the value is processed as $n-128$.
- The skip perforation amount does not change even if the paper feed amount is changed following a skip perforation designation.
- The skip perforation setting is released upon receipt of the page length designation command.
- If DIP switch 1-4 is set to ON, the skip perforation amount is set to 1 inch (25.4 mm). If DIP switch 1-4 is set to OFF, skip perforation is not executed unless specified by ESC+N+n.
- ESC+O will override the skip perforation setting established when DIP switch 1-4 is set to ON.

HORIZONTAL TAB STOP SETTING:

Sets horizontal tabulations specified values.

Name: Setting: ESC+D+n_1+n_2+...+n_x+0
Release: ESC+D+0

Code: Setting: 27,68,n_1,n_2,...,n_x,0 DEC 1B,44,n_1,n_2,...,n_x,00 HEX
Release: 27,68,0 DEC 1B,44,00 HEX

Input Format: Setting: LPRINT CHR$(27)+"D"+CHR$(n_1)+CHR$($n_2$)+...+CHR$(n_x)+CHR$(0) ;
Release: LPRINT CHR$(27)+"D"+CHR$(0) ;

Comments:

- Horizontal tabs are set from the left margin position.
- Horizontal tabs must be designated such that $n_1 < n_2 < \ldots < n_x$.
- A maximum of 32 tabs may be set on a single line.
- ESC+D+n_1+n_2+...+n_x+0 sets horizontal tab stops. The HT command executes the tab designation.
- In proportional spacing, horizontal tabs are set with pica pitch.
- If the character pitch is altered after designating horizontal tabs, the tab positions do not change.
- When the margin is changed, horizontal tabs will be moved according new left margin setting.

HORIZONTAL TAB UNIT SETTING:

Sets horizontal tabulation every "n" positions, beginning at the left margin.

Name: ESC+e+0+n

Code: 27,101,0,n DEC 1B,65,00,n HEX

Input Format: LPRINT CHR$(27)+"e"+CHR$(0)+CHR$(n);

Comments:

- The HT unit setting is released when n=0 (ESC+e+0+0).
- HT is set every 8 columns in the default status.
- ESC+e+0+n sets horizontal tab units. The HT command executes this tab designation.

HORIZONTAL TAB EXECUTION:

Executes the horizontal TAB as designated by ESC+D+n_1+n_2+...+n_k+0, ESC+e+0+n.

Name: HT

Code: 9 DEC 09 HEX

Input Format: LPRINT CHR$(9);

Comments:

- If the value of the horizontal TAB is less than the present column position, that HT is ignored.
- When in underline mode, the blank spaces between consecutive HT print positions are not underlined.
- When the printer is powered up, TAB is automatically set every 8 characters.

VERTICAL TAB STOP SETTING:

Sets vertical tabulation to specified values.

Name: Setting: ESC+B+n_1+n_2+...+n_x+0
Release: ESC+B+0

Code: Setting: 27,66,n_1,n_2,...,n_x,0 DEC 1B,42,n_1,n_2,...,n_x,00 HEX
Release: 27,66,0 DEC 1B,42,00 HEX

Input Format: Setting: LPRINT CHR$(27)+"B"+CHR$(n_1)+CHR$($n_2$)+...+CHR$(n_x)+CHR$(0) ;
Release: LPRINT CHR$(27)+"B"+CHR$(0) ;

Comments:

- VT is set from the top of page position.
- Vertical tabs must be designated such that $n_1<n_2<\ldots<n_x$.
- A maximum of 16 tabs may be set.
- ESC+B+n_1+n_2+...+n_x+0 sets vertical tab stops. The VT command executes the tab designation.
- If the paper feed amount is changed after a VT designation, the VT positions remain as initially set.
- VT setting is released by page length designation commands.

VERTICAL TAB UNIT SETTING:

Sets vertical tabulation every "n" lines, beginning at top of page.

Name: ESC+e+1+n

Code: 27,101,1,n DEC 1B,65,01,n HEX

Input Format: LPRINT CHR$(27)+"e"+CHR$(1)+CHR$(n) ;

Comments:

- The VT unit setting is released when n=1 (ESC+e+1+1).
- The maximum length for a VT unit is the page length, and when a VT unit designation exceeds the page length, the setting is ignored.
- If the paper feed amount is changed after a VT unit designation, the VT unit remains as initially set.
- When n=0, data is printed, but the paper is not fed.
- The VT unit setting is released by page length designation command.

VERTICAL TAB EXECUTION:

Executes the vertical TAB as designated by ESC+B+n_1+n_2+...+n_x+0, ESC+b+m+n_1+n_2+...+n_x+0, or ESC+e+1+n.

Name: VT

Code: 11 DEC 0B HEX

Input Format: LPRINT CHR$(11) ;

Comments:

- When TABs are set with VT or VFU setting command and when there is no tab setting on a position exceeding present line, data is printed out and paper is fed to the next top of page position (same as FF).
- When vertical TAB has not been set by ESC+B+n_1+n_2+...+n_x+0, execution of VT causes data in the buffer to be printed and advances the paper one line (same function as LF).

VFU CHANNEL SELECTION:

Selects one of eight channels in the Vertical Format Unit (VFU).

Name: ESC+/+n 0≦n≦7

Code: 27,47,n DEC 1B,2F,n HEX

Input Format: LPRINT CHR$(27)+"/"+CHR$(n) ;

Comments:
- The value of n must be in the range 0≦n≦7 and selects one of eight channels (0–7).
- Channel 0 is the default setting.

VFU SETTING:

Sets the tab position of each channel in the VFU (Vertical Format Unit).

Name:
Setting: ESC+b+m+n_1+n_2+...+n_x+0 0≦m≦7, 1≦x≦16
Release: ESC+b+m+0

Code:
Setting: 27,98,m,n_1,n_2,...,n_x,0 DEC 1B,62,m,n_1,n_2,...,n_x,00 HEX
Release: 27,98,m,0 DEC 1B,62,m,00 HEX

Input Format:
Setting: LPRINT CHR$(27)+"b"+CHR$(m)+CHR$($n_1$)+CHR$(n_2)+ ...+CHR$($n_x$)+CHR$(0);
Release: LPRINT CHR$(27)+"b"+CHR$(m)+CHR$(0);

Comments:
- The VFU has eight channels. A maximum of 16 vertical tabs can be set by each channel.
- The VFU is valid for 0≦m≦7 and selects one channel based on the value of "m".
- Any VFU setting exceeding the page length is ineffective.
- To operate the VFU, input the VT code (11 DEC) after selecting the channel via VFU channel selection command (ESC+/+n).
- The VFU position does not change even if paper feed amount is altered after VFU setting.
- The VFU setting is released by the page length designation commands.
- The vertical tab specified with ESC+B+n_1+n_2+...+n_x+0 is set to VFU channel 0.

SETS HIGH SPEED MODE:

Sets 12 cpi High Speed Mode.

Name:
Setting: ESC+h+n n=1,49,129,177
Release: ESC+h+m m=0,48,128,176

Code:
Setting: 27,104,n DEC 1B,68,n HEX
Release: 27,104,n DEC 1B,68,m HEX

Comments:
- This command sets 12 cpi high speed, after sending ESC+M or ESC+!.
- The print speeds are as follows:

  Draft: 240 cps
  Text: 160 cps
  LQ: 80 cps

BACKSPACE:

Prints data in buffer and backspaces one space before printing next character.

Name: BS

Code: 8 DEC 08 HEX

Input Format: LPRINT CHR$(8) ;

Comment:

- Since BS backspaces the width of a character, the backspacing amount will depend upon the character mode set when the BS code was received.

CARRIAGE RETURN:

Prints all data in buffer.

Name: CR

Code: 13 DEC 0D HEX

Input Format: LPRINT CHR$(13) ;

Comments:

- Certain computers issue an automatic line feed with a carriage return. Check your computer manual for details.
- When DIP switch 1-3 is ON the paper is fed automatically (a LF is executed automatically) whenever a CR code is executed.
- CR code releases single line double width printing set by SO.

HOME PRINT HEAD:

Causes print head to return to its home position.

Name: ESC+<

Code: 27,60 DEC 1B,3C HEX

Input Format: LPRINT CHR$(27)+"<" ;

SINGLE DIRECTION:

Sets single direction (left to right) printing mode.

Name: Setting: ESC+U+n n=1,49,129,177
Release: ESC+U+m m=0,48,128,176

Code: Setting: 27,85,n DEC 1B,55,n HEX
Release: 27,85,m DEC 1B,55,m HEX

Input Format: Setting: LPRINT CHR$(27)+"U"+CHR$(n) ;
Release: LPRINT CHR$(27)+"U"+CHR$(m) ;

HALF SPEED PRINTING:

Sets printing to half speed.

Name:	Setting:	ESC+s+n	n=1,49,129,177
	Release:	ESC+s+m	m=0,48,128,176
Code:	Setting:	27,115,n DEC	1B,73,n HEX
	Release:	27,115,m DEC	1B,73,m HEX
Input Format:	Setting:	LPRINT CHR$(27)+"s"+CHR$(n) ;	
	Release:	LPRINT CHR$(27)+"s"+CHR$(m) ;	

Comment:
- Half speed printing can be set only in the draft pica, draft elite, standard density image, double speed double density image, CRT I image and CRT II image modes.

n-SPACE CARRIAGE MOVEMENT:

Skips "n" spaces between present and next character positions.

Name: ESC+f+0+n

Code: 27,102,0,n DEC 1B,66,00,n HEX

Input Format: LPRINT CHR$(27)+"f"+CHR$(0)+CHR$(n) ;

Comments:
- Spacing size depends upon present character pitch.
- The value of n must be in the range $0 \leqq n \leqq 127$. If $n \geqq 128$, the designation is executed with a spacing of n−128.
- When underlining, spaces skipped by ESC+f+0+n are not underlined.
- If the number of spaces to be skipped would cause printing to begin beyond the right margin setting, then those spaces beyond the right margin are ignored.

RELATIVE HORIZONTAL POSITION:

Moves the printhead to a relative horizontal position.

Name: ESC+\+n_1+n_2

Code: 27,92,n_1,n_2 DEC 1B,5C,n_1,n_2 HEX

Input Format: LPRINT CHR$(27)+"\"+CHR$(n_1)+CHR$($n_2$);

Comment:
- This command moves the printhead (n_1+256×n_2)/120 inch in Draft or Text, or (n_1+256×n_2)/180 inch in LQ or Proportional from current position at which point printing of following data will start.
- The printhead can be moved to either left or right.
  To move m dots to right: n_1=m mod 256, n_2=INT(m/256)
  To move m dots to left: n_1=(65536−m)−n_2×256, n_2=INT((65536−m)/256)

ABSOLUTE HORIZONTAL POSITION:

Moves the printhead to an absolute horizontal position.

Name: ESC+$+$n_1$+$n_2$

Code: 27,36,n_1,n_2 DEC 1B,24,n_1,n_2 HEX

Input Format: LPRINT CHR$(27)+"$"+CHR$($n_1$)+CHR$(n_2);

Comment:

- This command moves the printhead to a position $n_1+256\times n_2$ dots (units) from the left margin. Each unit equals 1/60th of an inch.

CANCEL:

Clears all data in the buffer.

Name: CAN

Code: 24 DEC 18 HEX

Input Format: LPRINT CHR$(24) ;

REMOTE PRINTER SELECT:

Selects the printer remotely, enabling it to receive data.

Name: DC1 (Device Control 1)

Code: 17 DEC 11 HEX

Input Format: LPRINT CHR$(17) ;

Comments:

- Receipt of DC1 while the printer is deselected by DC3 enables the printer to receive data.
- The print buffer data previously received between DC3 and DC1 is lost.

REMOTE PRINTER DESELECT:

Deselects the printer remotely, disabling it from receiving data.

Name: DC3 (Device Control 3)

Code: 19 DEC 13 HEX

Input Format: LPRINT CHR$(19);

Comment:

- All data sent in deselect status becomes invalid. In order to return to select status, send DC1 code.

DELETE:

Deletes the last character stored in the buffer.

Name: DEL

Code: 127 DEC 7F HEX

Input Format: LPRINT CHR$(127);

Comment:

- Only ordinary text may be DELeted. Bit image data, spacing between output generated by consecutive TABs, and character mode designations cannot be DELeted.

MSB ON:

Sets the MSB to 1.

Name: ESC+>

Code: 27,62 DEC 1B,3E HEX

Input Format: LPRINT CHR$(27)+">";

Comments:

- ESC+> has no effect on bit image data.
- This setting can be released by ESC+#.

MSB OFF:

Sets the MSB to 0.

Name: ESC+=

Code: 27,61 DEC 1B,3D HEX

Input Format: LPRINT CHR$(27)+"=";

Comments:

- ESC+= has no effect on bit image data.
- This setting can be released by ESC+#.

MSB CANCEL:

Sets printer to receive 8th bit "as is".

Name: ESC+#

Code: 27,35 DEC 1B,23 HEX

Input Format: LPRINT CHR$(27)+"#";

Comment:

- This setting has no effect on bit image data.

REPEAT DATA:

Repeats data n times.

Name:	Start: ESC+V+n End: ESC+V+0	$1 \leqq n \leqq 255$
Code:	Start: 27,86,n DEC End: 27,86,0 HEX	1B,56,n DEC 1B,56,0 HEX

Input Format: Start: LPRINT CHR$(27)+"V"+CHR$(n);
End: LPRINT CHR$(27)+"V"+CHR$(0);

Comments:

- ESC+V+n defines the beginning of data to be repeated, and ESC+V+0 defines the end of data.
- ESC+V+n causes the repetition of data n times, there is a limit of up to 2K characters.
- ESC+V+n command can be nested up to 5 times.

FONT DOWN LINE LOADING:

Defines down line load characters into specified address locations in RAM.

Name: ESC+&+0+n+m+d_0+d_1+d_2+P_1+...+P_x

Code: 27,38,0,n,m,d_0,d_1,d_2,P_1...P_x DEC 1B,26,00,n,m,d_0,d_1,d_2,P_1...P_x HEX

Input Format: LPRINT CHR$(27)+"&"+CHR$(0)+CHR$(n)+CHR$(m)+CHR$($d_0$)+CHR$(d_1)+CHR$($d_2$)
+CHR$($P_1$)+...+CHR$(P_x);

Comments:

- The values n and m are the ASCII address locations of the first and last characters being defined.
- d_0=Left Space
  d_1=Body
  d_2=Right Space

	d_1	$d_0+d_1+d_2$
Draft, Text	9	12
LQ 10 cpi	29	36
LQ 12 cpi	23	30
LQ 15 cpi	15	24
PS	37	42

SELECTS ROM CG OR DOWNLOADED CG:

Name: ESC+%+n n=0,48,128,176
(Select ROM CG)

ESC+%+n n=1,49,129,177
(Select downloaded CG)

Code: 27,37,n DEC 1B,25,n HEX

Input Format: LPRINT CHR$(27)+"%"+CHR$(n);

ROM CHARACTER GENERATOR SET COPY:

Copies internal ROM CG font into downloadable font area.

Name: ESC+:+0+0+0

Code: 27,58,0,0,0 DEC 1B,3A,00,00,00 HEX

Input Format: LPRINT CHR$(27)+" : "+CHR$(0)+CHR$(0)+CHR$(0);

Comments:

- All ROM CG font in draft and LQ modes are copied to the downloadable font area.
- Downloadable font can be copied regardless of the downloadable font capacity.
- Usable capacity of downloadable font does not decrease by using ROM CG set copying.
- Upon receipt of the command, all previous downloaded font will be changed to ROM CG font. The usable capacity of downloadable font returns to the initial state.
- When altering only part of the ROM CG, use this command before font downloading.

BELL:

Sounds buzzer for approximately 0.5 second.

Name: BEL

Code: 7 DEC 07 HEX

Input Format: LPRINT CHR$(7) ;

ESCAPE:

First byte of each multi-byte printer control code.

Name: ESC

Code: 27 DEC 1B HEX

Input Format: LPRINT CHR$(27);

Comment:

- Cannot be generated by the ESC key on certain computers.

NULL:

Last byte of certain multi-byte printer control codes.

Name: NUL

Code: 0 DEC 00 HEX

Input Format: LPRINT CHR$(0);

RESET PRINTER:

Initializes printer, causing data in the print buffer, but not in the receive buffer, to be cleared.

Name: ESC+@

Code: 27,64 DEC 1B,40 HEX

Input Format: `LPRINT CHR$(27)+"@";`

Comment:

- Refer to Section 3.5 on page 3-7 for an explanation of printer initialization.

PAPER-OUT DETECTION:

Enables paper-out detector.

Name:
Setting: ESC+9
Release: ESC+8

Code:
Setting: 27,57 DEC 1B,39 HEX
Release: 27,56 DEC 1B,38 HEX

Input Format:
Setting: `LPRINT CHR$(27)+"9";`
Release: `LPRINT CHR$(27)+"8";`

Comments:

- Enabling of the paper-out detector causes printing to stop 13 lines from the bottom of the page. Paper-out status is then established.
- Disabling of the paper-out detector causes printing to continue after paper end.

7. IBM Proprinter Mode Commands

This chapter covers software commands of IBM Proprinter mode. The software commands are grouped into the following classifications:

- **Font Selection**
- **Character Pitch Selection**
- **Character Highlight Selection**
- **Character Set Selection**
- **Bit Image (Graphics) Mode Selection**
- **Paper Feed Control**
- **Page Format Control**
- **Tabulation**
- **Carriage Control**
- **Data Control**
- **Down Line Load Character Selection**
- **Miscellaneous**

FONT SELECTION

Name	Function	Page
ESC+I+0	Sets draft font print mode	7-5
ESC+I+2	Sets LQ font print mode	7-5
ESC+I+4	Sets download draft font print mode	7-5
ESC+I+6	Sets download LQ font print mode	7-5
ESC+G	Sets LQ printing	7-5
ESC+H	Releases LQ printing	7-5
ESC+k+n	Selects print font style	7-5
ESC+S+0	Selects superscript printing	7-6
ESC+S+1	Selects subscript printing	7-6
ESC+T	Releases sub/superscript printing	7-6

CHARACTER PITCH SELECTION

Name	Function	Page
ESC+:	Sets 12 cpi (elite pitch) printing	7-7
SI	Sets 17 cpi (compressed) printing	7-7
ESC+SI	Sets 17 cpi (compressed) printing	7-7
DC2	Releases elite and compressed printing	7-7

CHARACTER HIGHLIGHT SELECTION

Name	Function	Page
ESC+E	Sets emphasis printing	7-8
ESC+F	Releases emphasis printing	7-8
SO	Sets single-line double width printing	7-8
DC4	Releases single-line double width printing	7-8
ESC+SO	Sets single-line double width printing	7-8
ESC+W+1	Sets double width printing	7-8
ESC+W+0	Releases double width printing	7-8
ESC+-+1	Sets underlining	7-9
ESC+-+0	Releases underlining	7-9
ESC+_+1	Sets overlining	7-9
ESC+_+0	Releases overlining	7-9

CHARACTER SET SELECTION

Name	Function	Page
ESC+7	Sets alternate character set 1	7-9
ESC+6	Sets alternate character set 2	7-10

BIT IMAGE (GRAPHICS) MODE SELECTION

Name	Function	Page
ESC+K+n_1+n_2	Sets 8 pin image standard density (60 dot/inch)	7-10
ESC+L+n_1+n_2	Sets 8 pin image double density (120 dot/inch)	7-10
ESC+Y+n_1+n_2	Sets 8 pin image double density/double speed(120 dot/inch)	7-10
ESC+Z+n_1+n_2	Sets 8 pin bit image quadruple density (240 dot/inch)	7-10

PAPER FEED SELECTION

Amount

Name	Function	Page
ESC+0	Sets paper feed to 1/8 inch (3.2 mm)	7-11
ESC+1	Sets paper feed to 7/72 inch (0.1 mm)	7-11
ESC+2	Executes line spacing set by ESC+A+n	7-11
ESC+A+n	Sets paper feed to n/72 inch	7-11
ESC+3+n	Sets paper feed to n/216 inch	7-12
ESC+5	Automatic line feed	7-12

Execution

Name	Function	Page
LF	Feeds paper one line	7-12
FF	Feeds paper to next top of form position	7-13
ESC+J+n	Executes one-line paper feed of n/216 inch	7-13
ESC+j+n	Executes one-line reverse paper feed of n/216 inch	7-13

PAGE FORMAT CONTROL

Name	Function	Page
ESC+C+0+n	Sets page length in inches	7-14
ESC+C+n	Sets page length in lines	7-14
ESC+X+n_1+n_2	Sets left and right margin	7-14
ESC+N+n	Sets skip perforation	7-15
ESC+O	Releases skip perforation	7-15
ESC+4	Sets top of form	7-15

TABULATION

Horizontal

Name	Function	Page
ESC+D+n_1+...+n_x+0	Sets horizontal tab	7-16
ESC+D+0	Releases horizontal tab	7-16
HT	Executes horizontal tab	7-16

Vertical

Name	Function	Page
ESC+B+n_1+...+n_x+0	Sets vertical tab	7-17
ESC+B+0	Releases vertical tab	7-17
VT	Executes vertical tab	7-17
ESC+R	Returns to default tabs	7-17

CARRIAGE CONTROL

Name	Function	Page
BS	Prints, then backspaces one character	7-18
CR	Prints a line, then returns carriage	7-18
ESC+U+1	Sets single direction printing	7-18
ESC+U+0	Releases single direction printing	7-18

DATA CONTROL

Name	Function	Page
CAN	Clears data in buffer	7-19
DC1	Selects printer remotely	7-19
ESC+Q+3	Deselects printer remotely	7-19

DOWN LINE LOAD CHARACTER SELECTION

Name	Function	Page
ESC+&+0+n+m	Defines download font	7-20

MISCELLANEOUS

Name	Function	Page
BEL	Sounds the buzzer	7-20
ESC	First byte of multi-byte control codes	7-20
NUL	Last byte of certain multi-byte control codes	7-21
ESC+\	Prints continuously from all character chart	7-21
ESC+^	Prints one character from all character chart	7-22
ESC+9	Enables paper-out detection	7-22
ESC+8	Disables paper-out detection	7-22

PRINT MODE SELECT:

Selects the printing fonts and quality.

Name: ESC+I+n n=0,2,4,6

Code: 27,73,n DEC 1B,49,n HEX

Input Format: LPRINT CHR$(27)+"I"+CHR$(n);

Comments:

- This command selects the Character Generator (ROM CG or DOWNLOAD character) and printing fonts.
  - n=0: Internal characters draft fonts.
  - n=2: Internal characters LQ fonts.
  - n=4: Download characters draft fonts.
  - n=6: Download characters LQ fonts.
- This command is operational only when the FONT and PITCH selector switches are set to "Pgm".

LQ PRINTING:

Selects letter quality font printing.

Name: Setting: ESC+G
Release: ESC+H

Code: Setting: 27,71 DEC 1B,47 HEX
Release: 27,72 DEC 1B,48 HEX

Input Format: Setting: LPRINT CHR$(27)+"G" ;
Release: LPRINT CHR$(27)+"H" ;

Comments:

- This command sets letter quality printing in whichever pitch is set at the time.
- This command is operational only when the FONT and PITCH selector switches are set to "Pgm".

FONT STYLE:

Selects font style.

Name: ESC+k+n n=0,1,2,3

Code: 27,107,n DEC 1B,6B,n HEX

Input Format: LPRINT CHR$(27)+"k"+CHR$(n);

Comment:

- The following values can be used.
  - n=0: Draft Font
  - n=1: Text Font
  - n=2: Courier Font
  - n=3: Option LQ Font

SUPERSCRIPT FONT:

Selects superscript font with characters printed on the top ⅔ area of the line. Characters are reduced to ⅔ their original height.

Name:	Setting:	ESC+S+n	n=0,48,128,176
	Release:	ESC+T	
Code:	Setting:	27,83,n DEC	1B,53,n HEX
	Release:	27,84 DEC	1B,54 HEX
Input Format:	Setting:	LPRINT CHR$(27)+"S"+CHR$(n) ;	
	Release:	LPRINT CHR$(27)+"T";	

Comments:

- Superscript characters are normal width.
- Superscript characters can be printed in the letter quality mode.
- In the letter quality mode, characters are reduced to ⅔ their original width.
- ESC+T also releases the subscript print setting.

SUBSCRIPT FONT:

Selects subscript font with characters printed on the bottom ⅔ area of the line. Characters are reduced to ⅔ their original height.

Name:	Setting:	ESC+S+n	n =1,49,129,177
	Release:	ESC+T	
Code:	Setting	27,83,n DEC	1B,53, n HEX
	Release:	27,84 DEC	1B,54 HEX
Input Format:	Setting:	LPRINT CHR$(27)+"S"+ CHR$(n);	
	Release:	LPRINT CHR$(27)+"T";	

Comments:

- Subscript characters are normal width.
- Subscript characters can be printed in the letter quality mode.
- In the letter quality mode, characters are reduced to ⅔ their original width.
- ESC+T also releases the superscript print setting.

ELITE PITCH:

Sets printing to 12 characters per inch (163 characters per line).

Name: Setting: ESC+:
Release: DC2

Code: Setting: 27,58 DEC 1B, 3A HEX
Release: 18 DEC 12 HEX

Input Format: Setting: LPRINT CHR$(27)+" : " ;
Release: LPRINT CHR$(18) ;

Comment:

- This command does not affect Draft, Text or LQ font mode.

COMPRESSED PITCH:

Sets compressed pitch (17 characters per inch) printing.

Name: Setting: SI or ESC+SI
Release: DC2

Code: Setting: 15 or 27,15 DEC 0F or 1B,0F HEX
Release: 18 DEC 12 HEX

Input Format: Setting: LPRINT CHR$(15);
or
LPRINT CHR$(27)+CHR$(15) ;
Release: LPRINT CHR$(18);

Comments:

- Setting compressed pitch produces 17 characters per inch or 233 characters per line.
- This command is operational only when the FONT and PITCH selector switches are set to "Pgm".

EMPHASIS PRINTING:

Sets printing to twice the original horizontal dot density.

Name: Setting: ESC+E
Release: ESC+F

Code: Setting: 27,69 DEC 1B,45 HEX
Release: 27,70 DEC 1B,46 HEX

Input Format: Setting: LPRINT CHR$(27)+"E";
Release: LPRINT CHR$(27)+"F";

Comment:

- Emphasized characters are printed at half speed (100 characters per second in draft pica pitch).

DOUBLE WIDTH PRINTING—SINGLE LINE:

Sets double width (elongated) character printing for one line only.

Name: Setting: SO or ESC+SO
Release: DC4 or ESC+W+m m=0,48,128,176

Code: Setting: 14 or 27,14 DEC 0E or 1B, 0E HEX
Release 1: 20 DEC 14 HEX
Release 2: 27,87,m DEC 1B,57,m HEX

Input Format: Setting: LPRINT CHR$ (14);
or
LPRINT CHR$(27)+CHR$(14);
Release 1: LPRINT CHR$(20);
Release 2: LPRINT CHR$(27)+"W"+CHR$(m);

Comment:

- Single-line double width printing is released when:
  —a LF, FF, or VT is executed.
  —a CR is executed
  —DC4 or ESC+W+m is executed.

DOUBLE WIDTH PRINTING:

Sets double width (elongated) character printing.

Name: Setting: ESC+W+n n=1,49,129,177
Release: ESC+W+m m=0,48,128,176

Code: Setting: 27,87,n DEC 1B,57,n HEX
Release: 27,87,m DEC 1B,57,m HEX

Input Format: Setting: LPRINT CHR$(27)+"W"+CHR$(n);
Release: LPRINT CHR$(27)+"W"+CHR$(m);

Comment:

- Double width printing set by ESC+W+n is only released by ESC+W+m.

UNDERLINING:

Sets continuous underlining of characters.

Name: Setting: ESC+–+n n=1,49,129,177
Release: ESC+–+m m=0,48,128,176

Code: Setting: 27,45,n DEC 1B,2D,n HEX
Release: 27,45,m DEC 1B,2D,m HEX

Input Format: Setting: LPRINT CHR$(27)+“–”+CHR$(n) ;
Release: LPRINT CHR$(27)+“–”+CHR$(m) ;

Comments:

- Bit image data, spaces set by the HT code and IBM Graphic characters are not underlined.
- Pin No. 24 of the print head is used for underlining.

OVERLINING:

Sets continuous overlining of characters.

Name: Setting: ESC+_+n n=1,49,129,177
Release: ESC+_+m m=0,48,128,176

Code: Setting: 27,95,n DEC 1B,5F,n HEX
Release: 27,95,m DEC 1B,5F,m HEX

Input Format: Setting: LPRINT CHR$(27)+“_”+CHR$(n) ;
Release: LPRINT CHR$(27)+“_”+CHR$(m);

Comments:

- Bit image data and spaces set by the HT code, IBM Graphic characters are not overlined.
- Pin No. 1 of the print head is used for overlining.

IBM CHARACTER SET I:

Selects IBM Proprinter character set 1.

Name: ESC+7

Code: 27,55 DEC 1B,37 HEX

Input Format: LPRINT CHR$(27)+“7” ;

Comment:

- Refer to Appendix A.

IBM CHARACTER SET II:

Selects IBM Proprinter character set 2.

Name: ESC+6

Code: 27,54 DEC 1B,36 HEX

Input Format: LPRINT CHR$(27)+"6" ;

Comment:

- Refer to Appendix A.

8-PIN STANDARD DENSITY GRAPHICS:

Sets standard density graphics mode (816 dots per line/60 dots per inch (25.4 mm)).

Name: ESC+K+n_1+n_2

Code: 27,75,n_1,n_2 DEC 1B,4B,n_1,n_2 HEX

Input Format: LPRINT CHR$(27)+"K"+CHR$(n_1)+CHR$($n_2$) ;

8-PIN DOUBLE DENSITY GRAPHICS:

Sets double density graphics mode (1632 dots per line/120 dots per inch (25.4 mm)).

Name: ESC+L+n_1+n_2

Code: 27,76,n_1,n_2 DEC 1B,4C,n_1,n_2 HEX

Input Format: LPRINT CHR$(27)+"L"+CHR$(n_1)+CHR$($n_2$) ;

DOUBLE SPEED, DOUBLE DENSITY GRAPHICS:

Sets double speed, double density graphics mode (1632 dots per line/120 dots per inch (25.4 mm)).

Name: ESC+Y+n_1+n_2

Code: 27,89,n_1,n_2 DEC 1B,59,n_1,n_2 HEX

Input Format: LPRINT CHR$(27)+"Y"+CHR$(n_1)+CHR$($n_2$) ;

Comment:

- Horizontally adjacent dots cannot be printed.

8-PIN QUADRUPLE DENSITY GRAPHICS:

Sets quadruple density graphics mode (3264 dots per line/240 dots per inch (25.4 mm)).

Name: ESC+Z+n_1+n_2

Code: 27,90,n_1,n_2 DEC 1B,5A,n_1,n_2 HEX

Input Format: LPRINT CHR$(27)+"Z"+CHR$(n_1)+CHR$($n_2$) ;

Comment:

- Horizontally adjacent dots cannot be printed.

1/8 INCH PAPER FEED:

Sets paper feed amount to 1/8 inch (3.2 mm).

Name: ESC+0

Code: 27,48 DEC 1B,30 HEX

Input Format: LPRINT CHR$(27)+"0" ;

Comments:

- ESC+0 sets 1/8 inch paper feed in all printer modes.
- The paper feed amount is not exactly 1/8 inch, for the minimum unit is 1/180 inch.

7/72 INCH PAPER FEED:

Sets paper feed amount to 7/72 inch.

Name: ESC+1

Code: 27,49 DEC 1B,31 HEX

Input Format: LPRINT CHR$(27)+"1";

Comment:

- The paper feed amount is not exactly 7/72 inch, for the minimum unit is 1/180 inch.

LINE SPACING:

Executes line spacing set by ESC+A+n.

Name: ESC+2

Code: 27,50 DEC 1B,32 HEX

Input Format: LPRINT CHR$(27)+"2";

n/72 INCH PAPER FEED:

Sets programmable paper feed amount to n/72 inch.

Name: ESC+A+n

Code: 27,65,n DEC 1B,41,n HEX

Input Format: LPRINT CHR$(27)+"A"+CHR$(n) ;

Comments:

- ESC+2 must be input after ESC+A+n for n/72 inch paper feed to become effective.
- n/72 inch paper feed is valid for 0≦n≦85.
- The paper feed amount is not exactly n/72 inch, for the minimum unit is 1/180 inch.
- The IBM Proprinter mode defaults to 1/6 inch.

$n/216$ INCH PAPER FEED:

Sets programmable paper feed amount to $n/216$ inch.

Name: ESC+3+n

Code: 27,51,n DEC 1B,33,n HEX

Input Format: LPRINT CHR$(27)+"3"+CHR$(n);

Comments:

- $n/216$ inch paper feed is valid for $0 \leqq n \leqq 255$.
- The paper feed amount is not exactly $n/216$ inch, for the minimum unit is $1/180$ inch.

AUTOMATIC LINE FEED MODE:

Automatically executes a Line Feed following a Carriage Return.

Name: Setting: ESC+5+n n=1,49,129,177
Release: ESC+5+m m=0,48,128,176

Code: Setting: 27,53,n DEC 1B,35,n HEX
Release: 27,53,m DEC 1B,35,m HEX

Input Format: Setting: LPRINT CHR$(27)+"5"+CHR$(n);
Release: LPRINT CHR$(27)+"5"+CHR$(m);

Comments:

- DIP switch 1-3 also controls the auto line feed function (refer to section 2.4). Setting this switch to the ON position is equivalent to executing the ESC+5+n command. Similarly, setting the switch to the OFF position is equivalent to executing the ESC+5+m command.
- LF is tied to CR in this mode.

LINE FEED (LF):

Causes data in buffer to be printed and then executes a single line feed.

Name: LF

Code: 10 DEC 0A HEX

Input Format: LPRINT CHR$(10) ;

Comments:

- When the new line position falls within the perforation skip area, the paper advances to the next top of form position.
- If there is no data, "space" data (ASCII 32), or blanks between HT print positions in the buffer, LF feeds the paper by only 1 line.
- The amount of spacing generated by LF is a function of the paper feed amount setting.
- LF code releases single-line double width printing set by SO.
- DIP switch 2-6 controls the Automatic CR function. When this switch is OFF, LF executes a single line feed. The carriage, however, does not return to the left margin position. When this switch is ON, a Carriage Return command (CR) is added to each Line Feed (LF).

FORM FEED (FF):

Feeds paper to next top of form position after first printing any data in the buffer.

Name: FF

Code: 12 DEC 0C HEX

Input Format: LPRINT CHR$(12) ;

Comments:

- FF releases single-line double width printing set by SO.
- Amount of form feed depends upon page length set by the page length control command.

---

n/216 INCH PAPER FEED:

Prints out the data in the print buffer and feeds the paper n/216 inch.

Name: ESC+J+n

Code: 27,74,n DEC 1B,4A,n HEX

Input Format: LPRINT CHR$(27)+"J"+CHR$(n) ;

Comments:

- When DIP switch 2-6 (Automatic CR) is ON, Carriage Return command (CR) is added automatically to this command.
- Single-line, n/216 inch paper feed is valid for $0 \leqq n \leqq 255$.
- This command sets the paper feed for ONE line only. Subsequent paper feed returns to previous setting. However, the carriage does not return to the left margin position. Instead, printing of next line begins where previous printing left off.
- This command does not release single-line double width printing.
- The paper feed amount is not exactly n/216 inch, for the minimum unit is 1/180 inch.

---

n/216 INCH REVERSE DIRECTION SINGLE LINE PAPER FEED:

Prints out the data in the print buffer and feeds the paper n/216 inch in reverse direction.

Name: ESC+j+n

Code: 27,106,n DEC 1B,6A,n HEX

Input Format: LPRINT CHR$(27)+"j"+CHR$(n);

Comments:

- Reverse, single line n/216 inch paper feed is valid for $0 \leqq n \leqq 255$.
- This command sets reverse direction paper feed for one line only. Subsequent paper feed returns to the previous setting. The carriage will not return, however, to the left margin position. Instead, the printing of the next line begins where the previous printing left off.
- This command does not release single-line double width printing.
- The paper feed amount is not exactly n/216 inch, for the minimum unit is 1/180 inch.

Notes:

- Reverse paper feed cannot be executed in the area from the bottom perforation upward 3.6 inches (91.4 mm). Additionally, the perforation should not be included in the area of reverse paper feed.
- Multi-part forms should not be used with reverse paper feed.

PAGE LENGTH (INCHES):

Sets page length in inches.

Name: ESC+C+0+n

Code: 27,67,0,n DEC 1B,43,00,n HEX

Input Format: LPRINT CHR$(27)+"C"+CHR$(0)+CHR$(n) ;

Comments:

- Upon receipt of ESC+C+0+n, the present line position becomes the top of page position.
- The value of n must be in the range $1 \leqq n \leqq 22$.
- ESC+C+0+n releases the VT, VFU and skip perforation settings.
- The page length does not change even if the paper feed amount is changed.
- The terms "form" and "page" are interchangeable.

PAGE LENGTH (LINES):

Sets page length in number of lines.

Name: ESC+C+n

Code: 27,67,n DEC 1B,43,n HEX

Input Format: LPRINT CHR$(27)+"C"+CHR$(n) ;

Comments:

- Upon receipt of ESC+C+n, the present line position becomes the top of page position.
- The value of n must be in the range $1 \leqq n \leqq 127$. If $n=0$, page length returns to the inch designation.
- ESC+C+n releases the VT, VFU and skip perforation settings.
- The page length does not change even if the paper feed amount is changed.
- The terms "form" and "page" are interchangeable.

MARGIN SET:

Sets positions of left and right margins.

Name: ESC+X+n_1+n_2

Code: 27,88,n_1,n_2 DEC 1B,58,n_1,n_2 HEX

Input Format: LPRINT CHR$(27)+"X"+CHR$(n_1)+CHR$($n_2$) ;

Comments:

- The left margin column is set to n_1 in the current width, and the right margin column is set to n_2.
- Permissible values of "n_2" are given below.

Pica print	$2 \leqq n_2 \leqq 136$
Compressed print	$4 \leqq n_2 \leqq 233$

- Any right margin designation to the left of the left margin position is ignored.
- Setting the margin clears all data in the buffer.
- Once the margin position is set, a change in the character mode will not alter this margin setting.
- When $n_1=0$, the left margin does not change. When $n_2=0$, the right margin does not change.

SKIP PERFORATION:

Sets skip-over perforation.

Name: Setting: ESC+N+n
Release: ESC+O

Code: Setting: 27,78,n DEC 1B,4E,n HEX
Release: 27,79 DEC 1B,4F HEX

Input Format: Setting: LPRINT CHR$(27)+"N"+CHR$(n) ;
Release: LPRINT CHR$(27)+"O" ;

Comments:

- The value of n specifies the number of lines (or n times the current line spacing amount) to be skipped at the bottom of the page.
- This command is effective only for $1 \leqq n \leqq 127$. If $n \geqq 128$, the value is processed as $n-128$.
- The skip perforation amount does not change even if the paper feed amount is changed following a skip perforation designation.
- The skip perforation setting is released upon receipt of the page length designation command.
- If DIP switch 1-4 is set to ON, the skip perforation amount is set to 1 inch (25.4 mm). If DIP switch 1-4 is set to OFF, skip perforation is not executed unless specified by ESC+N+n.
- ESC+O will override the skip perforation setting established when DIP switch 1-4 is set to ON.

TOP OF FORM:

Sets top of form.

Name: ESC+4

Code: 27,52 DEC 1B,34 HEX

Input Format: LPRINT CHR$(27)+"4" ;

Comment:

- This command sets the current paper position as the top of form.

HORIZONTAL TAB STOP SETTING:

Sets horizontal tabulations specified values.

Name: Setting: ESC+D+n_1+n_2+...+n_x+0
Release: ESC+D+0

Code: Setting: 27,68,n_1,n_2,...,n_x,0 DEC   1B,44,n_1,n_2,...,n_x,00 HEX
Release: 27,68,0 DEC   1B,44,00 HEX

Input Format: Setting: LPRINT CHR$(27)+"D"+CHR$(n_1)+CHR$($n_2$)+...+CHR$(n_x)+CHR$(0) ;
Release: LPRINT CHR$(27)+"D"+CHR$(0) ;

Comments:

- Horizontal tabs are set from the left margin position.
- Horizontal tabs must be designated such that $n_1 < n_2 < \ldots < n_x$.
- A maximum of 32 tabs may be set on a single line.
- ESC+D+n_1+n_2+...+n_x+0 sets horizontal tab stops. The HT command executes the tab designation.
- In proportional spacing, horizontal tabs are set with pica pitch.
- If the character pitch is altered after designating horizontal tabs, the tab positions do change.
- When the margin is changed, horizontal tabs will be moved according to new left margin setting.

HORIZONTAL TAB EXECUTION:

Executes the horizontal TAB as designated by ESC+D+n_1+n_2+...n_x+0.

Name: HT

Code: 9 DEC   09 HEX

Input Format: LPRINT CHR$(9);

Comments:

- If the value of the horizontal TAB is less than the present column position, that HT is ignored.
- When in underline mode, the blank spaces between consecutive HT print positions are not underlined.
- When the printer is powered up, TAB is automatically set every 8 characters.

VERTICAL TAB STOP SETTING:

Sets vertical tabulation to specified values.

Name: Setting: ESC+B+n_1+n_2+...+n_x+0
Release: ESC+B+0

Code: Setting: 27,66,n_1,n_2,...,n_x,0 DEC 1B,42,n_1,n_2,...,n_x,00 HEX
Release: 27,66,0 DEC 1B,42,00 HEX

Input Format: Setting: LPRINT CHR$(27)+"B"+CHR$(n_1)+CHR$($n_2$)+...+CHR$(n_x)+CHR$(0) ;
Release: LPRINT CHR$(27)+"B"+CHR$(0) ;

Comments:

- VT is set from the top of page position.
- Vertical tabs must be designated such that $n_1 < n_2 < \ldots < n_x$.
- A maximum of 64 tabs may be set.
- ESC+B+n_1+n_2+...+n_x+0 sets vertical tab stops. The VT command executes the tab designation.
- If the paper feed amount is changed after a VT designation, the VT positions remain as initially set.
- VT setting is released by page length designation commands.

VERTICAL TAB EXECUTION:

Executes the vertical TAB as designated by ESC+B+n_1+n_2+...+n_x+0.

Name: VT

Code: 11 DEC 0B HEX

Input Format: LPRINT CHR$(11);

Comments:

- When TABs are set with VT setting command and there is no tab setting on a position exceeding present line, data is printed out and advances the paper one line (same as LF).
- When vertical TAB has not been set by ESC+B+n_1+n_2+...+n_x+0, execution of VT causes data in the buffer to be printed and advances the paper one line (same function as LF).

ALL TAB INITIAL CLEAR:

Sets all tabs to power ON settings.

Name: ESC+R

Code: 27,82 DEC 1B,52 HEX

Input Format: LPRINT CHR$(27)+"R" ;

Comment:

- This command sets horizontal tabs at every 8 position and clears all vertical tabs.

BACKSPACE:

Prints data in buffer and backspaces one space before printing next character.

Name: BS

Code: 8 DEC 08 HEX

Input Format: LPRINT CHR$(8) ;

Comment:

- Since BS backspaces the width of a character, the backspacing amount will depend upon the character mode set when the BS code was received.

CARRIAGE RETURN:

Prints all data in buffer.

Name: CR

Code: 13 DEC 0D HEX

Input Format: LPRINT CHR$(13) ;

Comments:

- Certain computers issue an automatic line feed with a carriage return. Check your computer manual for details.
- When DIP switch 1-3 is ON the paper is fed automatically (a LF is executed automatically) whenever a CR code is executed.

SINGLE DIRECTION:

Sets single direction (left to right) printing mode.

Name:	Setting:	ESC+U+n	n=1,49,129,177
	Release:	ESC+U+m	m=0,48,128,176
Code:	Setting:	27,85,n DEC	1B,55,n HEX
	Release:	27,85,m DEC	1B,55,m HEX
Input Format:	Setting:	LPRINT CHR$(27)+"U"+CHR$(n) ;	
	Release:	LPRINT CHR$(27)+"U"+CHR$(m) ;	

CANCEL:

Clears all data in the buffer.

Name: CAN

Code: 24 DEC 18 HEX

Input Format: LPRINT CHR$(24);

REMOTE PRINTER SELECT:

Selects the printer remotely, enabling it to receive data.

Name: DC1 (Device Control 1)

Code: 17 DEC 11 HEX

Input Format: LPRINT CHR$(17);

Comments:

- Receipt of DC1 while the printer is deselected by ESC+Q+3 enables the printer to receive data.
- The print buffer data previously received between ESC+Q+3 and DC1 is lost.

REMOTE DESELECT PRINTER:

Deselects the printer remotely, disabling it from receiving data.

Name: ESC+Q+3

Code: 27,81,3 DEC 1B,51,03 HEX

Input Format: LPRINT CHR$(27)+"Q"+CHR$(3);

Comment:

- All data sent in deselect status becomes invalid. In order to return to select status, send DC1 code.

FONT DOWN LINE LOADING:

Defines down line load characters into specified address locations in RAM.

Name: ESC+&+0+n+m+d_0+d_1+d_2+P_1+...+P_x

Code: 27,38,0,n,m,d_0,d_1,d_2,P_1...P_x DEC 1B,26,00,n,m,d_0,d_1,d_2,P_1...P_x HEX

Input Format: LPRINT CHR$(27)+"&"+CHR$(0)+CHR$(n)+CHR$(m)+CHR$($d_0$)+CHR$(d_1)+CHR$($d_2$)+CHR$(P_1)+...+CHR$($P_x$);

Comments:

- The values n and m are the ASCII address locations of the first and last characters being defined.
- d_0=Left Space
  d_1=Body
  d_2=Right Space

	d_1	$d_0+d_1+d_2$
Draft, Text	9	12
LQ 10 cpi	29	36
LQ 12 cpi	23	30
LQ 15 cpi	15	24
PS	37	42

Note: Down line load command in IBM Proprinter mode does not have compatibility with IBM Proprinter.

BELL:

Sounds buzzer for approximately 0.5 second.

Name: BEL

Code: 7 DEC 07 HEX

Input Format: LPRINT CHR$(7) ;

ESCAPE:

First byte of each multi-byte printer control code.

Name: ESC

Code: 27 DEC 1B HEX

Input Format: LPRINT CHR$(27);

Comment:

- Cannot be generated by the ESC key on certain computers.

NULL:

Last byte of certain multi-byte printer control codes.

Name: NUL

Code: 0 DEC 00 HEX

Input Format: LPRINT CHR$(0) ;

ALL CHARACTER CHART PRINTING (Continuous):

Prints continuously from all character chart.

Name: ESC+\+n_1+n_2

Code: 27,92,n_1,n_2 DEC 1B,5C,n_1,n_2 HEX

Input Format: LPRINT CHR$(27)+"\"+CHR$(n_1)+CHR$($n_2$);

Comments:

- This command allows the printing of all characters including characters with an ASCII value below decimal 32.
- Refer to IBM All Character Chart. (Appendix A).
- The values specified for n_1 and n_2 indicate how many characters to print from All Character Chart, calculating the total count with this formula; Total count=$n_2 \times 256 + n_1$.
- The data following this command and designated by n_1 and n_2, will be printed as characters from the All Character Chart.

ALL CHARACTER CHART PRINTING (Single):

Prints single character from all character chart.

Name: ESC+^

Code: 27,94 DEC 1B,5E HEX

Input Format: LPRINT CHR$(27)+"^";

Comments:

- Only the next data following this command will be printed as a character from the All Character Chart.
- Refer to IBM All Character Chart (Appendix A).

PAPER-OUT DETECTION:

Enables paper-out detector.

Name: Setting: ESC+9
Release: ESC+8

Code: Setting: 27,57 DEC 1B,39 HEX
Release: 27,56 DEC 1B,38 HEX

Input Format: Setting: LPRINT CHR$(27)+"9";
Release: LPRINT CHR$(27)+"8";

Comments:

- Enabling of the paper-out detector causes printing to stop 13 lines from the bottom of the page. Paper-out status is then established.
- Disabling of the paper-out detector causes printing to continue after paper end.

8. Diablo 630 Mode Commands

This chapter covers software commands of Diablo 630 mode. The software commands are grouped into the following classifications:

- **Print Mode**
- **Bit Image (Graphics) Mode Selection**
- **Vertical Movement**
- **Formatting**
- **Word Processing**
- **Horizontal Movement**
- **Down Line Load Character Selection**
- **Miscellaneous**

PRINT MODE

Name	Function	Page
ESC+w+n	Sets 10,12,15,17 cpi or proportional spacing	8-4
ESC+P	Sets proportional spacing mode	8-4
ESC+Q	Releases proportional spacing mode	8-4
ESC+US+n	Sets horizontal motion index (HMI)	8-5
ESC+S	Resets horizontal motion index (HMI)	8-5
ESC+RS+n	Sets vertical motion index (VMI)	8-5
ESC+/	Sets bi-directional printing mode	8-6
ESC+\	Sets single directional printing mode	8-6
ESC+6	Sets backward printing mode	8-6
ESC+5	Sets forward printing mode	8-6
ESC+"	Sets auto line feed mode	8-6
ESC+#	Resets auto line feed mode	8-6
ESC+?	Sets auto carriage return mode	8-7
ESC+!	Resets auto carriage return mode	8-7
ESC+3	Sets graphics mode	8-7
ESC+4	Releases graphics mode	8-7
ESC+7	Enables print suppression mode	8-7
ESC+x+n	Selects print quality	8-8
ESC+K+n	Selects print font type	8-8
ESC+s+0	Selects superscript printing	8-9
ESC+s+1	Selects subscript printing	8-9
ESC+t	Releases super/subscript printing	8-9
ESC+r+n	Sets international character set	8-10
SO	Sets single-line double width printing	8-10
DC4	Releases single-line double width printing	8-10

BIT IMAGE (GRAPHICS) MODE SELECTION

Name	Function	Page
ESC+k+n_1+n_2	Sets 8 pin image standard density (60 dot/inch)	8-10
ESC+l+n_1+n_2	Sets 8 pin image double density (120 dot/inch)	8-10
ESC+y+n_1+n_2	Sets 8 pin image double density/double speed (120 dot/inch)	8-11
ESC+z+n_1+n_2	Sets 8 pin bit image quadruple density (240 dot/inch)	8-11
ESC+*+m+n_1+n_2	Sets bit image mode selection	8-11

VERTICAL MOVEMENT

Name	Function	Page
LF	Executes single forward line feed	8-12
ESC+LF	Executes single reverse line feed	8-12
ESC+U	Executes forward half-line feed	8-12
ESC+D	Executes reverse half-line feed	8-12
FF	Advances paper to next top of form	8-13
VT	Executes vertical tab	8-13
ESC+VT+n	Executes absolute vertical tab	8-13

FORMATTING

Name	Function	Page
ESC+9	Sets the left margin	8-14
ESC+0	Sets the right margin	8-14
ESC+T	Sets the top margin	8-14
ESC+L	Sets the bottom margin	8-15
ESC+C	Clears the top and bottom margins	8-15
ESC+FF+n	Sets the number of lines per page	8-15
ESC+1	Sets horizontal tab stop	8-16
ESC+8	Clears horizontal tab stop	8-16
ESC+–	Sets vertical tab stop	8-16
ESC+2	Clears all horizontal and vertical tab stop	8-16

WORD PROCESSING

Name	Function	Page
ESC+DC1+n	Sets offset value	8-17
ESC+O	Sets bold printing	8-17
ESC+W	Sets shadow printing	8-17
ESC+&	Releases bold/shadow printing	8-17
ESC+E	Sets underlining	8-18
ESC+R	Releases underlining	8-18
ESC+X	Disables all word processing modes	8-18

HORIZONTAL MOVEMENT

Name	Function	Page
CR	Prints all data in buffer	8-18
BS	Backspaces width of a character	8-18
ESC+BS	Backspaces 1/120 inch (0.21 mm)	8-19
HT	Executes horizontal tab	8-19
ESC+HT+n	Executes absolute horizontal tab	8-19

DOWN LINE LOAD CHARACTER SELECTION

Name	Function	Page
ESC+%+0	Selects ROM CG	8-19
ESC+%+1	Selects download CG	8-19
ESC+$+0+n+m	Defines download font	8-20
ESC+:+0+0+0	Copies internal ROM CG font into download CG	8-20

MISCELLANEOUS

Name	Function	Page
ESC+CR+P	Initializes the printer after all data in buffer are processed	8-21
ESC+SUB+I	Initializes the printer after all data in buffer are processed	8-21
ESC+Z	Prints special character 1	8-21
ESC+Y	Prints special character 2	8-21
BEL	Sounds the buzzer	8-22
ESC	First byte of multi-byte control code	8-22
DEL	The printer ignores this code	8-22
NUL	The printer ignores this code	8-22

PROGRAMMABLE PITCH:

Sets a character pitch at 10, 12, 15, 17, or proportional spacing.

Name: ESC+w+n n=0,1,2,3,4

Code: 27,119,n DEC 1B,77,n HEX

Input Format: LPRINT CHR$(27)+"w"+CHR$(n);

Comments:

- This command is operational only when the FONT and PITCH selector switches are set to "Pgm".
- Pitches are set as follows:
  - n=0: 10 characters per inch (25.4 mm) HMI=12
  - n=1: 12 characters per inch (25.4 mm) HMI=10
  - n=2: 15 characters per inch (25.4 mm) HMI=8
  - n=3: 17 characters per inch (25.4 mm) HMI=7
  - n=4: proportional spacing
- This command releases any previous character pitch settings.
- Execution of ESC+w+n alters character pitch only and does not affect the character font.

PROPORTIONAL SPACING (PS) MODE:

Sets printing using proportional spacing between characters.

Name: Setting: ESC+P
Release: ESC+Q

Code: Setting: 27,80 DEC 1B,50 HEX
Release: 27,81 DEC 1B,51 HEX

Input Format: Setting: LPRINT CHR$(27)+"P";
Release: LPRINT CHR$(27)+"Q";

Comments:

- This command is operational only when the FONT and PITCH selector switches are set to "Pgm".
- In proportional spacing mode, the SP spacing amount is determined by the current HMI. The BS spacing amount is equal to that of the character or SP immediately input prior to executing BS.
- Proportional spacing can also be set by the pitch selector switch.
- ESC+Q releases proportional spacing. The subsequent spacing amount is determined by the HMI.
- Proportional spacing is not released by ESC+X.
- Proportional spacing is released by ESC+S.

HORIZONTAL MOTION INDEX (HMI) SET:

Sets the amount of carriage spacing after printing or spacing, to (n−1)/120 inch (0.21 mm).

Name: ESC+US+n $1 \leqq n \leqq 126$

Code: 27,31,n DEC 1B,1F,n HEX

Input Format: LPRINT CHR$(27)+CHR$(31)+CHR$(n);

Comments:

HMI is the distance between characters to be printed or the distance that the carriage moves when SP code is executed. This distance is defined in multiples of 1/120 inch (0.21 mm).
For example, in 10 pitch which 10 characters per inch can be printed, the distance between characters is 1/10 inch. Therefore, HMI is 12 indicated by multiples of 1/120 inch. Minimum HMI is 0, maximum is 125 (1.04 inch nominal). HMI is set freely among these values by this command. When HMI=0, no carriage movement occurs.

- When the printer is powered up 10 pitch is automatically set.
- HMI affects SP, BS, HT and ESC+HT+n.
- ESC+S resets HMI to that specified by the pitch selector switch.
- Changing the HMI does not affect the left/right margin.
- If $n \geqq 128$, the value is processed as n−128.
- When n=0 or 127, next data is used for n.

HORIZONTAL MOTION INDEX (HMI) RESET:

Resets HMI to value defined by the pitch selector switch.

Name: ESC+S

Code: 27,83 DEC 1B,53 HEX

Input Format: LPRINT CHR$(27)+ "S";

Comments:

- ESC+S does not reset VMI.
- Resetting the HMI does not affect the left/right margin.

VERTICAL MOTION INDEX (VMI) SET:

Sets line spacing pitch to (n−1)/48 inch.

Name: ESC+RS+n $1 \leqq n \leqq 126$

Code: 27,30,n DEC 1B,1E,n HEX

Input Format: LPRINT CHR$(27)+CHR$(30)+CHR$(n);

Comments:

VMI is the distance between lines, or the distance that the paper (platen) moves for LF code. This distance is defined in multiples of 1/48 inch (0.53 mm).
For example, when 6 lines are printed in an inch, the distance between lines is 1/6 inch. Therefore VMI is 8 indicated by multiples of 1/48 inch. Minimum VMI is 0, maximum is 125 (2.60 inch nominal). VMI is set freely among these values by this command. When VMI=0, no paper movement occurs.

- When the printer is powered up, 1/6 inch line feed is set.
- VMI affects LF, VT, ESC+LF, ESC+U, ESC+D, ESC+FF+n and ESC+VT+n.
- Changing the VMI does not affect the top/bottom margin.
- If $n \geqq 128$, the value is processed as n−128.
- When n=0 or 127, next data is used for n.

BI-DIRECTIONAL PRINTING MODE:

Sets bi-directional printing.

Name:	Setting:	ESC+/	
	Release:	ESC+\	
Code:	Setting:	27,47 DEC	1B,2F HEX
	Release:	27,92 DEC	1B,5C HEX
Input Format:	Setting:	LPRINT CHR$(27)+“/”;	
	Release:	LPRINT CHR$(27)+“\”;	

Comments:

- Bi-directional printing means that printing occurs during the left-to-right movement of carriage as well as on the right-to-left return trip.
- In single direction printing mode, the carriage is only moved left-to-right or only moved right-to-left.
- In bi-directional printing mode, the carriage is moved by the shortest way.

BACKWARD PRINTING MODE:

Prints data from right to left.

Name:	Setting:	ESC+6	
	Release:	ESC+5	
Code:	Setting:	27,54 DEC	1B,36 HEX
	Release:	27,53 DEC	1B,35 HEX
Input Format:	Setting:	LPRINT CHR$(27)+“6”;	
	Release:	LPRINT CHR$(27)+“5”;	

Comments:

- Backward printing is released by CR code.
- In backward printing, the SP code moves the carriage right-to-left while the BS code moves the carriage left-to-right.
- Tabulation, bit image data, CR, and paper feed functions are unaffected by backward printing.
- Any data to be printed to the left of the left margin is overprinted at the left margin.

AUTOMATIC LINE FEED MODE:

Automatically executes a Line Feed following a Carriage Return.

Name:	Setting:	ESC+"	
	Release:	ESC+#	
Code:	Setting:	27,34 DEC	1B,22 HEX
	Release:	27,35 DEC	1B,23 HEX
Input Format:	Setting:	LPRINT CHR$(27)+CHR$(34);	
	Release:	LPRINT CHR$(27)+“#”;	

Comments:

- DIP switch 1-3 also controls the auto line feed function (refer to Section 2.4). Setting this switch to the ON position is equivalent to executing the ESC+" command. Similarly, setting the switch to the OFF position is equivalent to executing the ESC+# command.
- LF is tied to CR in this mode.
- ESC+" is effective when the DIP switch 1-3 is OFF.

AUTOMATIC CARRIAGE RETURN MODE:

Automatically executes a carriage return following a line feed.

Name:	Setting:	ESC+?	
	Release:	ESC+!	
Code:	Setting:	27,63 DEC	1B,3F HEX
	Release:	27,33 DEC	1B,21 HEX
Input Format:	Setting:	LPRINT CHR$(27)+“?”;	
	Release:	LPRINT CHR$(27)+“!”;	

Comments:

- CR is tied to LF in this mode.
- BOLD, SHADOW and GRAPHICS modes are not released by this CR.

GRAPHICS MODE:

Sets graphics mode.

Name:	Setting:	ESC+3	
	Release:	ESC+4	
Code:	Setting:	27,51 DEC	1B,33 HEX
	Release:	27,52 DEC	1B,34 HEX
Input Format:	Setting:	LPRINT CHR$(27)+“3”;	
	Release:	LPRINT CHR$(27)+“4”;	

Comments:

- Graphics mode is released by CR.
- Horizontal movement commands should be used consciously to move the print position, because the print position does not automatically move after a character has been printed in graphics mode.
- In graphics mode, SP and BS move the carriage 1/60 inch (0.42 mm) instead of HMI, and LF and ESC+LF feed the paper 1/48 inch (0.53 mm) instead of VMI.
- The amount of paper feed by executing ESC+U or ESC+D is a half of VMI as well as normal printing mode.

PRINT SUPPRESSION MODE:

All printable characters are replaced by SP.

Name:	ESC+7	
Code:	27, 55 DEC	1B, 37 HEX
Input Format:	LPRINT CHR$(27)+“7”;	

Comments:

- Print suppression mode is released by CR.
- In print suppression mode, all printable characters are replaced by SP, but single or multi byte control codes are effective.

LETTER QUALITY FONT:

Selects letter quality font printing.

Name:	Setting:	ESC+x+n	n=1,49,129,177
	Release:	ESC+x+n	n=0,48,128,176
Code:	Setting:	27,120,n DEC	1B,78,n HEX
	Release:	27,120,n DEC	1B,78,n HEX
Input Format:	Setting:	LPRINT CHR$(27)+"x"+CHR$(n);	
	Release:	LPRINT CHR$(27)+"x"+CHR$(n);	

Comments:
- This command sets letter quality printing in whichever pitch is set at the time.
- Sub/superscript characters can be printed in the letter quality font.
- This command is operational only when the FONT and PITCH selector switches are set to "Pgm".

SELECT FONT STYLE:

Selects Font Style.

Name:	ESC+K+n	$0 \leqq n \leqq 3$
Code:	27,75,n DEC	1B,4B,n HEX
Input Format:	LPRINT CHR$(27)+"K"+CHR$(n);	

Comment:
- The following values can be used.
  n=0: Draft Font
  n=1: Text Font
  n=2: Courier Font
  n=3: Option Font

SUPERSCRIPT FONT:

Selects superscript font with characters printed on the top ⅔ area of the line. Characters are reduced to ⅔ their original height.

Name:	Setting:	ESC+s+n	n=0,48,128,176
	Release:	ESC+t	
Code:	Setting:	27,115,n DEC	1B,73,n HEX
	Release:	27,116 DEC	1B,74 HEX
Input Format:	Setting:	LPRINT CHR$(27)+"s"+CHR$(n);	
	Release:	LPRINT CHR$(27)+ "t";	

Comments:

- Superscript characters are normal width.
- Superscript characters can be printed in the letter quality mode.
- In the letter quality mode, characters are reduced to ⅔ their original width.
- ESC+t also releases the subscript print setting.

SUBSCRIPT FONT:

Selects subscript font with characters printed on the bottom ⅔ area of the line. Characters are reduced to ⅔ their original height.

Name:	Setting:	ESC+s+m	m=1,49,129,177
	Release:	ESC+t	
Code:	Setting	27,115,m DEC	1B,73,m HEX
	Release:	27,116 DEC	1B,74 HEX
Input Format:	Setting:	LPRINT CHR$(27)+"s"+CHR$(m);	
	Release:	LPRINT CHR$(27)+ "t";	

Comments:

- Subscript characters are normal width.
- Subscript characters can be printed in the letter quality mode.
- In the letter quality mode, characters are reduced to ⅔ their original width.
- ESC+t also releases the superscript print setting.

INTERNATIONAL CHARACTER SET:

Selects any one of 11 international character sets.

Name: ESC+r+n $0 \leqq n \leqq 10$

Code: 27,114,n DEC 1B,72,n HEX

Input Format: LPRINT CHR$(27)+"r"+CHR$(n);

Comments:
- Appendix A illustrates allocation of international characters to their respective locations.
- International character sets 0–7 can be set with DIP switches 1-5, 1-6, and 1-7.
- Character sets 8, 9, and 10 may be accessed through software ONLY.

DOUBLE WIDTH PRINTING—SINGLE LINE:

Sets double width (elongated) character printing for one line only.

Name: Setting: SO
Release: DC4

Code: Setting: 14 DEC 0E HEX
Release: 20 DEC 14 HEX

Input Format: Setting: LPRINT CHR$(14);
Release : LPRINT CHR$(20);

Comment:
- Single-line double width printing is released when:
  - —CR is executed.
  - —the printer is initialized.
  - —DC4, ESC+X are executed.

8-PIN STANDARD DENSITY GRAPHICS:

Sets standard density graphics mode (816 dots per line/60 dots per inch (25.4 mm)).

Name: ESC+k+n_1+n_2

Code: 27,107,n_1,n_2 DEC 1B,6B,n_1,n_2 HEX

Input Format: LPRINT CHR$(27)+"k"+CHR$(n_1)+CHR$($n_2$);

8-PIN DOUBLE DENSITY GRAPHICS:

Sets double density graphics mode (1632 dots per line/120 dots per inch (25.4 mm)).

Name: ESC+l+n_1+n_2

Code: 27,108,n_1,n_2 DEC 1B,6C,n_1,n_2 HEX

Input Format: LPRINT CHR$(27)+ "l" +CHR$(n_1)+CHR$($n_2$);

8-PIN DOUBLE SPEED, DOUBLE DENSITY GRAPHICS:

Sets double speed, double density graphics mode (1632 dots per line/120 dots per inch (25.4 mm)).

Name: ESC+y+n_1+n_2

Code: 27,121,n_1,n_2 DEC 1B,79,n_1,n_2 HEX

Input Format: LPRINT CHR$(27)+"y"+CHR$(n_1)+CHR$($n_2$);

Comment:

- Horizontally adjacent dots cannot be printed.

8-PIN QUADRUPLE DENSITY GRAPHICS:

Sets quadruple density graphics mode (3264 dots per line/240 dots per inch (25.4 mm)).

Name: ESC+z+n_1+n_2

Code: 27,122,n_1,n_2 DEC 1B,7A,n_1,n_2 HEX

Input Format: LPRINT CHR$(27)+"z"+CHR$(n_1)+CHR$($n_2$);

Comment:

- Horizontally adjacent dots cannot be printed.

BIT IMAGE MODE SELECTION:

Selects one of 8-pin and 24-pin bit image graphic modes.

Name: ESC+✳+m+n_1+n_2 m=0,1,2,3,4,6,32,33,38,39,40

Code: 27,42,m,n_1,n_2 DEC 1B,2A,m,n_1,n_2 HEX

Input Format: LPRINT CHR$(27)+"✳"+CHR$(m)+CHR$($n_1$)+CHR$(n_2);

Comments:

- The following table illustrates the various modes based upon the values of m.

m	Pin	Dots/Inch	Dots/Line	
0	8	60	816	Standard Density
1	8	120	1632	Double Density
2	8	120	1632	Double Speed, Double Density
3	8	240	3264	Quadruple Density
4	8	80	1088	CRT I
6	8	90	1224	CRT II
32	24	60	816	Standard Density
33	24	120	1632	Double Density
38	24	90	1224	CRT III
39	24	180	2448	Triple Density
40	24	360	4896	Hex Density

- When m=2,3,40, Horizontal adjacent dots cannot be printed.

LINE FEED:

Prints data in buffer, then executes a single line feed.

Name: LF

Code: 10 DEC 0A HEX

Input Format: LPRINT CHR$(10);

Comments:

- The amount of paper feed depends on current vertical motion index (VMI).
- Form Feed is executed when exceeding the bottom margin.
- In graphics mode, LF feed the paper 1/48 inch (0.53 mm) instead of VMI.

REVERSE LINE FEED:

Prints all data in buffer and executes a single reverse line feed.

Name: ESC+LF

Code: 27,10 DEC 1B,0A HEX

Input Format: LPRINT CHR$(27)+CHR$(10);

Comments:

- The amount of paper feed depends upon the most recent VMI setting.
- Reverse line feed can move the paper beyond the top margin.

FORWARD/REVERSE HALF-LINE FEED:

Prints all data in buffer and executes a forward/reverse half-line feed.

Name:
Forward: ESC+U
Reverse: ESC+D

Code:
Forward: 27,85 DEC 1B,55 HEX
Reverse: 27,68 DEC 1B,44 HEX

Input Format:
Forward: LPRINT CHR$(27)+ "U";
Reverse: LPRINT CHR$(27)+ "D";

Comments:

- The feeding amount depends on a half of VMI.
- When VMI is 0 or 1, these commands are ignored.

FORM FEED:

Prints all data in buffer and feeds paper to next top margin.

Name: FF

Code: 12 DEC 0C HEX

Input Format: LPRINT CHR$(12);

Comment:
- The form length is designated by ESC+FF+n.

VERTICAL TAB:

Prints all data in buffer and feeds paper to the next vertical tab stop position from current print line.

Name: VT

Code: 11 DEC 0B HEX

Input Format: LPRINT CHR$(11);

Comments:
- This command is ineffective when vertical tab stops have not been set below current print line.
- Form Feed is executed when exceeding the bottom margin.
- When a vertical tab stop has been set, the position of that tab stop is affected by a change in the VMI.

ABSOLUTE VERTICAL TAB:

Prints all data in buffer and feeds paper to line position designated.

Name: ESC+VT+n $1 \leqq n \leqq 126$

Code: 27,11,n DEC 1B,0B,n HEX

Input Format: LPRINT CHR$(27)+CHR$(11)+CHR$(n);

Comments:
- The absolute vertical tab value can exceed the top (bottom) margin.
- The line position of the top of form is 1.
- When VMI is 0, this command is ignored.
- If $n \geqq 128$, the value is processed as $n-128$.
- When n=0 or 127, next data is used for n.

LEFT MARGIN SET:

Sets left margin at the current carriage position.

Name: ESC+9

Code: 27,57 DEC 1B,39 HEX

Input Format: LPRINT CHR$(27)+"9";

Comments:

- First, using horizontal movement commands, move the print position to the desired position, then set the left margin. Any previously set left margin is released.
- The left margin may not be set to the right of the right margin.
- Printing may not be done to the left of the left margin.
- The absolute horizontal tab can be used to exceed the left margin.
- Changing the HMI does not affect the left margin.
- Changing the left margin does not affect horizontal tab stop.
- In backward printing mode, the print position cannot exceed the left margin.

RIGHT MARGIN SET:

Sets right margin at the current print position.

Name: ESC+0

Code: 27,48 DEC 1B,30 HEX

Input Format: LPRINT CHR$(27)+"0";

Comments:

- First, using horizontal movement commands, move the print position to the desired position, then set the right margin. Any previously set right margin is released.
- The right margin may not be set to the left of the left margin.
- Printing may not be done to the right of the right margin.
- The absolute horizontal tab can be used to exceed the right margin.
- Changing the HMI does not affect the right margin.
- Changing the right margin does not affect horizontal tab stop.

TOP MARGIN SET:

Sets top margin at the current paper position.

Name: ESC+T

Code: 27,84 DEC 1B,54 HEX

Input Format: LPRINT CHR$(27)+"T";

Comments:

- First, using vertical movement commands, move the paper to the desired position, then set the top margin. Any previously set top margin is released.
- The top margin may not be set below the bottom margin.
- Printing may not be done above the top margin without using the absolute vertical tab.
- The absolute vertical tab can be used to exceed the top margin.
- Changing the VMI does not affect the top margin.
- Changing the top margin does not affect vertical tab stop.
- ESC+C releases both the top and bottom margins.
- Reverse Line Feeds (ESC+LF and ESC+D) which would cause the paper to move above the top margin are possible.

BOTTOM MARGIN SET:

Sets bottom margin at the current paper position.

Name: ESC+L

Code: 27,76 DEC 1B,4C HEX

Input Format: LPRINT CHR$(27)+"L";

Comments:

- First, using vertical movement commands, move the paper to the desired position, then set the bottom margin. Any previously set bottom margin is released.
- The bottom margin may not be set above the top margin.
- Printing may not be done below the bottom margin without using the absolute vertical tab.
- The absolute vertical tab should be used to exceed the bottom margin.
- Changing the VMI does not affect the bottom margin.
- Changing the bottom margin does not affect vertical tab stop.
- ESC+C releases both the top and bottom margins.
- If Line Feeds (LF and ESC+U) are executed below the bottom margin the new line position will be the top margin of the next page.

TOP/BOTTOM MARGIN CLEAR:

Clears top and bottom margins.

Name: ESC+C

Code: 27,67 DEC 1B,43 HEX

Input Format: LPRINT CHR$(27)+"C";

Comments:

- This command does not clear right and left margins.
- ESC+C does not affect page length and line position.

FORM LENGTH:

Sets the number of lines per page to n.

Name: ESC+FF+n $1 \leqq n \leqq 126$

Code: 27,12,n DEC 1B,0C,n HEX

Input Format: LPRINT CHR$(27)+CHR$(12)+CHR$(n);

Comments:

- Executing a Form Length command releases any previously set form length, top and bottom margins, and all vertical tab stops.
- The current line position is set as top of form.
- Changing VMI does not affect form length.
- When VMI is 0, this command is ignored.
- If $n \geqq 128$, the value is processed as $n-128$.
- When $n=0$ or 127, next data is used for n.

HORIZONTAL TAB STOP SET/CLEAR:

Sets horizontal TAB stop at the current print position.

Name: Setting: ESC+1
Release: ESC+8

Code: Setting: 27,49 DEC 1B,31 HEX
Release: 27,56 DEC 1B,38 HEX

Input Format: Setting: LPRINT CHR$(27)+"1";
Release: LPRINT CHR$(27)+"8";

Comments:

- Up to 62 horizontal tab stops may be in force at one time.
- First, using horizontal movement commands, move the print position to the desired position, then set the horizontal tab stop.
- ESC+2 releases all horizontal and vertical tab stops.
- Horizontal tab stops are not affected by the changing of left/right margins.
- ESC+8 releases only one tab stop at the present print position.

VERTICAL TAB STOP SET:

Sets vertical TAB stop at the current print position.

Name: ESC+-

Code: 27,45 DEC 1B,2D HEX

Input Format: LPRINT CHR$(27)+"-";

Comments:

- Up to 62 vertical tab stops may be in force at one time.
- First, using vertical movement commands, move the print position to the desired position, then set the vertical tab stop.
- ESC+2 releases all horizontal and vertical tab stops.
- Vertical tab stops are not affected by the changing of top/bottom margins.

ALL HORIZONTAL/VERTICAL TAB STOPS CLEAR:

Clears all horizontal and vertical TAB stops.

Name: ESC+2

Code: 27,50 DEC 1B,32 HEX

Input Format: LPRINT CHR$(27)+"2";

OFFSET SELECTION:

Increases or decreases the amount of spacing by the setting of n. Especially effective in PS mode, because HMI is not active in PS mode.
The offset value is designated by n, as shown below.

Name: ESC+DC1+n (1≦n≦126)
where the value of offset is designated by (n), as below.

n	1	2	3	...	62	63	64	65	66	67	...	125	126
offset	1	2	3	...	62	63	0	−1	−2	−3	...	−61	−62

unit: 1/120 inch (0.21 mm)

Code: 27,17,n DEC 1B,11,n HEX

Input Format: LPRINT CHR$(27)+CHR$(17)+CHR$(n);

Comments:
- In PS mode, the offset value is added to the amount of spacing which is executed after printing a character.
- When the offset value is negative, the total amount of spacing cannot be negative.
- ESC+DC1+n is released by CR or ESC+X.
- If n≧128, the value is processed as n−128.
- When n=0 or 127, next data is used for n.

BOLD/SHADOW PRINTING MODE:

Name:	Setting BOLD:	ESC+O	
	Setting SHADOW:	ESC+W	
	Release:	ESC+&	
Code:	Setting BOLD:	27,79 DEC	1B,4F HEX
	Setting SHADOW:	27,87 DEC	1B,57 HEX
	Release:	27,38 DEC	1B,26 HEX
Input Format:	Setting BOLD:	LPRINT CHR$(27)+"O";	
	Setting SHADOW:	LPRINT CHR$(27)+"W";	
	Release:	LPRINT CHR$(27)+"&";	

Comments:
- In bold printing mode draft font is printed with horizontal double density, letter quality font with double printing at the same position.
- In shadow printing mode both of draft and letter quality fonts are double printed with 1/120 inch (0.21 mm) space between the first and the second printing.
- Bold/shadow printing mode is released by CR.
- If the BOLD, SHADOW printing commands are entered, that command entered most recently takes priority over the others.
- ESC+X releases all word processing modes including bold/shadow printing modes.

UNDERLINING MODE:

Name:	Setting :	ESC+E	
	Release:	ESC+R	
Code:	Setting :	27,69 DEC	1B,45 HEX
	Release:	27,82 DEC	1B,52 HEX
Input Format:	Setting :	LPRINT CHR$(27)+"E";	
	Release:	LPRINT CHR$(27)+"R";	

Comments:
- ESC+X releases all word processing modes including underlining modes.
- Printing underline is started when ESC+R, ESC+X, CR, LF or printing buffer full is detected.

WORD PROCESSING MODE RELEASE:

Releases shadow, bold, underline, offset selection.

Name: ESC+X

Code: 27,88 DEC 1B,58 HEX

Input Format: LPRINT CHR$(27)+"X";

Comment:
- ESC+X does not clear proportional spacing mode, HMI, VMI, and tab settings.

CARRIAGE RETURN:

Prints data in buffer.

Name: CR

Code: 13 DEC 0D HEX

Input Format: LPRINT CHR$(13);

BACKSPACE:

Prints data in buffer and backspaces one space before printing next character.

Name: BS

Code: 8 DEC 08 HEX

Input Format: LPRINT CHR$(8);

Comments:
- Since BS backspaces the width of a character, the backspacing amount will depend upon the pitch or HMI set when the BS code was received.
- Backspacing to the left (right) of the left (right) margin cannot be executed.

1/120 INCH BACKSPACE:

Prints data in buffer and backspaces 1/120 inch (0.21 mm) before printing next character.

Name: ESC+BS

Code: 27,8 DEC 1B,08 HEX

Input Format: LPRINT CHR$(27)+CHR$(8);

Comment:
- 1/120 inch backspacing to the left of the left margin cannot be executed.

HORIZONTAL TAB:

Executes the horizontal TAB to the next horizontal tab stop position previously set.

Name: HT

Code: 9 DEC 09 HEX

Input Format: LPRINT CHR$(9);

Comments:
- This command is ineffective when horizontal tab stops have not been set.
- When a horizontal tab stop has been set, the position of that tab stop is affected by a change in the HMI.
- If the value of the horizontal TAB exceeding the right margin, all data within correct printing range will be printed according to the HT setting(s). A single line feed is executed.

ABSOLUTE HORIZONTAL TAB:

Prints position designated.

Name: ESC+HT+n $1 \leqq n \leqq 126$

Code: 27,9,n DEC 1B,09,n HEX

Input Format: LPRINT CHR$(27)+CHR$(9)+CHR$(n);

Comments:
- The absolute horizontal tab value can exceed the right (left) margin.
- When HMI is 0, this command is ignored.
- If $n \geqq 128$, the value is processed as n–128.
- When n=0 or 127, next data is used for n.

SELECTS ROM CG OR DOWNLOADED CG:

Name: ESC+%+n n=0,48,128,176
(Select ROM CG)

ESC+%+n n=1,49,129,177
(Select downloaded CG)

Code: 27,37,n DEC 1B,25,n HEX

Input Format: LPRINT CHR$(27)+"%"+CHR$(n);

FONT DOWN LINE LOADING:

Defines down line load characters into specified address locations in RAM.

Name: ESC+$+0+n+m+$d_0$+$d_1$+$d_2$+$P_1$+...+$P_x$

Code: 27,36,0,n,m,d_0,d_1,d_2,P_1...P_x DEC 1B,26,00,n,m,d_0,d_1,d_2,P_1...P_x HEX

Input Format: LPRINT CHR$(27)+"$"+CHR$(0)+CHR$(n)+CHR$(m)+CHR$(d_0)+CHR$($d_1$)+CHR$(d_2)+CHR$($P_1$)+...+CHR$(P_x);

Comments:

- The values n and m are the ASCII address locations of the first and last characters being defined.
- d_0=Left Space
  d_1=Body
  d_2=Right Space

	d_1	$d_0+d_1+d_2$
Draft, Text	9	12
LQ 10 cpi	29	36
LQ 12 cpi	23	30
LQ 15 cpi	15	24
PS	37	42

ROM CHARACTER GENERATOR SET COPY:

Copies internal ROM CG font into downloadable font area.

Name: ESC+:+0+0+0

Code: 27,58,0,0,0 DEC 1B,3A,00,00,00 HEX

Input Format: LPRINT CHR$(27)+" : "+CHR$(0)+CHR$(0)+CHR$(0);

Comments:

- All ROM CG font in draft and LQ modes are copied to the downloadable font area.
- Downloadable font can be copied regardless of the downloadable font capacity.
- Usable capacity of downloadable font does not decrease by using ROM CG set copying.
- Upon receipt of the command, all previous downloaded font will be changed to ROM CG font. The usable capacity of downloadable font returns to the initial state.
- When altering only part of the ROM CG, use this command before font downloading.

REMOTE RESET:

Initializes the printer causing all data in the buffer to be printed.

Name: ESC+CR+P or ESC+SUB+I

Code: 27,13,80 or 27,26,73 DEC 1B,0D,50 or 1B,1A,49 HEX

Input Format: LPRINT CHR$(27)+CHR$(13)+“P”;
or
LPRINT CHR$(27)+CHR$(26) +“T’;

Comments:

- ESC+CR+P causes the printer to be initialized after all data in buffer are processed.
- ESC+SUB+I and ESC+CR+P command are the same function.

SPECIAL CHARACTER 1:

Prints special character 1 (¬).

Name: ESC+Z

Code: 27,90 DEC 1B,5A HEX

Input Format: LPRINT CHR$(27)+ “Z”;

SPECIAL CHARACTER 2:

Prints special character 2 (£).

Name: ESC+Y

Code: 27,89 DEC 1B,59 HEX

Input Format: LPRINT CHR$(27)+ “Y”;

BELL:

Sounds buzzer for approximately 0.5 second.

Name: BEL

Code: 7 DEC 07 HEX

Input Format: LPRINT CHR$(7);

Comment:

- If DIP switch 2-5 is set to OFF, the buzzer will not sound.

ESCAPE:

First byte of each multi-byte printer control code.

Name: ESC

Code: 27 DEC 1B HEX

Input Format: LPRINT CHR$(27);

Comment:

- ESC cannot be generated by the ESC key on certain computers.

DELETE:

The printer ignores this code.

Name: DEL

Code: 127 DEC 7F HEX

Input Format: LPRINT CHR$(127);

Comment:

- DEL as well as NUL is ignored by the printer.

NULL:

The printer ignores this code.

Name: NUL

Code: 0 DEC 00 HEX

Input Format: LPRINT CHR$(0);

Comment:

- NUL as well as DEL is ignored by the printer.

9. Interfaces

9.1 Parallel Interfacing

Communication with a computer is accomplished through a parallel interface based on the Centronics standard.

Specifications:

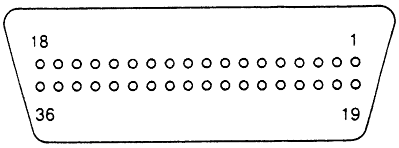
- data transfer speed: 1000 cps minimum
- synchronization: external STROBE pulse
- logic levels: TTL
- handshaking: BUSY and $\overline{\text{ACK}}$ signals
- connector type: 57-30360 (AMPHENOL) or equivalent

Warning Notice: In order to ensure compliance with the Class B Computing Device radio emission limitations, use only shielded cable with maximum 2 meters or less in length when connecting this peripheral to a computer.

When the printer is processing data, the BUSY signal is high. The printer will not accept new data from the computer. After the processing is completed, the BUSY signal goes low. (The BUSY signal is also high when the printer is OFF LINE). When this occurs, the $\overline{\text{ACK}}$ signal goes low indicating to the computer that the data has been processed and the printer is ready to accept more data. This handshaking routine occurs each time a character is sent to the printer.

	BUSY	SLCT	PO	$\overline{\text{ERROR}}$
ON LINE	LOW	HIGH	LOW	HIGH
OFF LINE	HIGH	LOW	LOW	LOW
PAPER OUT	HIGH	LOW	HIGH	LOW

Table 9.1 Printer Status Signals



Note: This is not a 57-30360 connector.

Figure 9.1 Parallel Interface Connector (Printer side)

Signal pin	Return side pin	Signal	Direction
1	19	$\overline{\text{STB}}$	Input
2	20	DATA 1	Input
3	21	DATA 2	
4	22	DATA 3	
5	23	DATA 4	
6	24	DATA 5	
7	25	DATA 6	
8	26	DATA 7	
9	27	DATA 8	
10	28	$\overline{\text{ACK}}$	Output
11	29	BUSY	Output
12		PO	Output
13		SLCT	Output
14		$\overline{\text{AUTO FEED XT}}$	Input
15			
16		SG	
17		FG	
18		+5 V	Output
31	30	$\overline{\text{PRIME}}$	Input
32		$\overline{\text{ERROR}}$	Output
33		SG	
34			
35			
36			

Table 9.2 Pin Configuration(Parallel)

Notes:

1. "INPUT" refers to a signal coming into the printer. "OUTPUT" denotes a signal exiting the printer.
2. "RETURN" denotes the return side wire of a twisted pair cable and is connected to signal ground.
3. All interface signals are at TTL levels.

Connector pin signals

$\overline{\text{STB}}$... STROBE

- This is a synchronizing input signal to read data into the printer.
- This signal is normally high. Data is read in when it goes low.
- The pulse must be low for at least 1 microsecond.

DATA 1–DATA 8

- These are the input signals which carry the 8 data bits of information.
- The signal is read in synchronization with the STROBE pulse. A high level indicates a logical "1".
- The signal must be present 0.5 microsecond before and after the STROBE pulse.

$\overline{\text{ACK}}$... ACKNOWLEDGE

- This is an output signal to the computer indicating that the printer is ready to receive the next block of data. It is sent out when the BUSY signal drops from high to low. Therefore, it can be thought of as a data request pulse.
- The signal is normally high. When the condition becomes true, the signal goes low.
- The $\overline{\text{ACK}}$ signal is automatically sent whenever the printer is switched ON LINE.

BUSY

- This output signal indicates the status of the printer. The signal is high when the printer is busy and cannot receive data.
- The signal is high under the following conditions:
  1. receive buffer full
  2. printer is processing data
  3. printer is OFF LINE
  4. printer is in an error condition

PO... PAPER OUT

- This output signal indicates that paper out detector detects the absence of paper.
- The signal is normally low and goes high during a "Paper Out" condition.

SLCT... SELECT

- SELECT is an output signal which indicates the ON LINE or OFF LINE state of the printer. The signal is high in the ON LINE state and low when OFF LINE.
- The printer enters the ON LINE state:
  1. when the printer is turned on
  2. when $\overline{\text{PRIME}}$ is received
  3. when the RESET command is received
  4. when the ON LINE switch is pressed

- The printer enters the OFF LINE state:
  1. when the printer is out of paper
  2. when the printer is switched OFF LINE

$\overline{\text{AUTO FEED XT}}$ $(\overline{\text{AFXT}})$

- This input signal determines if a line feed (LF) command will be added to each carriage return (CR).
- When $\overline{\text{AFXT}}$ is low, CR+LF action occurs. When $\overline{\text{AFXT}}$ is high, only a carriage return is performed.

- DIP SW1-3 can alter the response by the printer to an $\overline{\text{AFXT}}$ signal. If SW1-3 is ON, the printer will perform a CR+LF regardless of the level of the incoming signal. When SW1-3 is OFF, this automatic action is disabled.

SG... SIGNAL GROUND

- The twisted pair return wires (pins 19–30) are connected to signal ground.

FG... FRAME GROUND

- Frame ground is the same as chassis ground.

+5 V

This is for evaluation only. It should not be used to supply power for external equipment.

PRIME

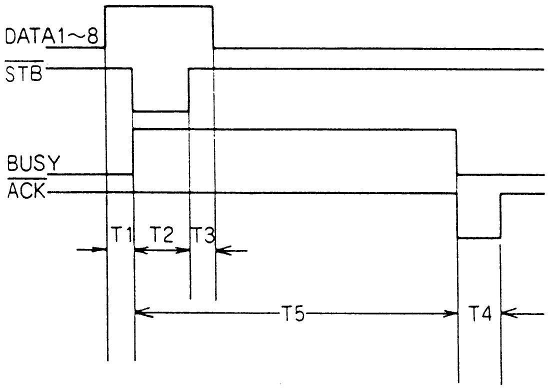
This input signal is used to initialize the printer. The signal is normally high and goes low to reset the printer. It can be received anytime during printer operation.

ERROR

This output signal is an "error" or "fault" condition. Normally high, this signal goes low when an error occurs. An error condition can be caused by:

1. a "Paper Out" condition.
2. the printer is OFF LINE
3. an overload condition exists

Timing Chart
(When normal printing code is received)



T1... 0.5μs (Min)
T2... 1μs (Min)
T3... 0.5μs (Min)
T4... 5μs (Max)
T5... 1ms or less when buffer not full
1s or less when buffer full

Figure 9.2 Timing Diagram

9.2 Serial Interfacing

Data input:
7 bit or 8 bit serial; 1 start bit, data bits (7 or 8), parity bit and stop bit.

Data input codes:
Characters; ASCII
Graphics; 8 bit

Transmission speed:
150, 300, 600, 1200, 2400, 4800 or 9600 baud baud

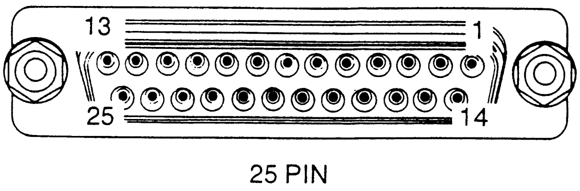


Figure 9.3 RS-232C Connector Pin Assignment

Signal Pin	Signal	Direction
1	FG	
2	TXD	OUTPUT
3	RXD	INPUT
7	SG	
20	DTR	OUTPUT

Table 9.3 Pin Configuration (Serial)

Warning Notice: In order to ensure compliance with the Class B Computing Device radio emission limitations, use only shielded cable with maximum 3 meters or less in length when connecting this peripheral to a computer.

Signal Descriptions

FG...Frame Ground

- Frame ground is the same as chassis ground.

TXD...Transmit Data

- Outputs serial data to the computer. SPACE indicates "0" data; MARK indicates "1" data.

RXD...Receive Data

- Inputs serial data from the computer. SPACE indicates "0" data; MARK indicates "1" data.

SG...Signal Ground

- Connected to signal ground of printers circuit board.

DTR...Data Terminal Ready

- This signal indicates that the printer is busy.
- When this signal is in the SPACE condition (+ side, EIA level), the printer is ready for data reception when DIP SW 3-6 is set to OFF.

Designation of Signal Polarity for Reverse Channel (or DTR)

This signal is sent to inform the computer that data reception is not possible at the present time, even though the printer might be on-line. Printer and computer polarities can be matched by setting DIP switch 3-6. Refer to page 2-6.

ON: This signal in "SPACE" informs the computer that the printer cannot receive transmitted data.

OFF: This signal in "MARK" informs the computer that the printer cannot receive transmitted data.

DIP switch 3-6 is set OFF prior to shipping from the factory.
MARK logic "1" (−27 V to −3 V)
SPACE logic "0" (3 V to 27 V)

Protocol

This printer supports two types of protocol: XON/XOFF and DTR. DTR protocol uses a DTR signal to indicate the condition of the printer, while XON/XOFF protocol uses an ASCII code corresponding to XON/XOFF.

DTR Protocol

When the input buffer is reduced to less than 128 bytes, the printer indicates that data reception is no longer possible by setting the DTR to the "MARK" condition. In this condition, the computer is forced to stop transmitting data. Should the computer continue transmitting, all excessive data will be ignored by the printer. The DTR is also set to "MARK" when the printer is off-line. When the input buffer is restored to a level of 288 bytes (when DIP switch 3-7 is OFF) or more, the DTR changes to the "SPACE" condition.

XON/XOFF Protocol

When the input buffer is reduced to less then 128 bytes, the printer outputs the XOFF character. When this character is output, the computer is forced to stop transmitting data. Should the computer continue transmitting, all excessive data will be ignored by the printer. The XOFF character is also output when the printer is off-line. The XON character is output when the input buffer is restored to a level of 288 bytes (when DIP switch 3-7 is OFF) or more, when the power is turned on, or when the printer goes from the off-line to the on-line condition.

XON=11 HEX (17 DEC)
XOFF=13 HEX (19 DEC)

10. Maintenance

The printer does not require any routine maintenance. However, reasonable care of the printer will extend its life. The following preventive and periodic measures are recommended:

Preventive Maintenance

- Keep all liquids away from the printer. Accidental spillage of a liquid into the printer can cause severe damage.
- Do not block the air flow around the printer. Do not place books, paper, or other items on top of the printer.
- Special care should be taken to protect the printer if it is used in an unfriendly environment such as a machine shop, a dusty or sandy area, etc.
- When transporting the printer, be sure the carriage stopper is in place. This will help prevent damage to the print head.
- The life of the print head can be extended by observing a few simple precautions.
- Do not operate the printer without paper and a ribbon cassette installed.
- Avoid continuous use of the same pins (underline, semi-graphics, etc.) without allowing the print head time to cool.
- Do not obstruct the movement of the print head while in operation.
- If the printer is not going to be used for an extended period, unplug the power cord.

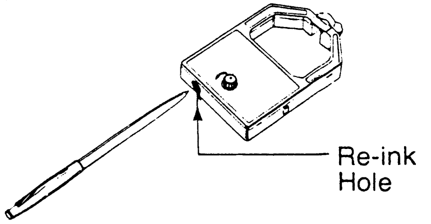
Periodic Maintenance

Cleaning the unit is the most important action the user can perform. The frequency of cleaning is dependent upon the environment.

- Turn the power OFF.
- Clean the case and covers with a soft cloth. Use any mild commercial cleaner.
- Remove the top and the smoked plastic covers. Vacuum or dust the inside area of the unit. Be very careful not to damage the flex ribbon cable and the carriage drive belt.
- The platen should be cleaned with denatured alcohol only.
- The carriage guide bar can be lubricated with a very light oil.
- If the printer should need servicing return the unit to an authorized Panasonic service center. Do not attempt to repair the unit. There are no user-repairable assemblies in the printer.

Ribbon Cassette

A single ribbon permits the printing of about 3 million characters. When the printing starts to fade, gently push the counter spring in the ribbon cassette hole with the tip of a ballpoint pen or other object. Once the ribbon cassette is mounted onto the carriage and printing is performed for a short time, the characters become thicker.



Note:
Do not re-ink the ribbon before printing starts to fade. If the ribbon has too much ink the characters may smear when printed.

- Wear and tear of the print head pins may cause serious damage of the ribbon and printing to fade. In such case the printer needs servicing.

Troubleshooting

Most problems associated with the printer can be traced to improper setup, installation, or cabling. Table 10.1 will assist the user in identifying and correcting some of the more common problems. If you need additional help, contact the store from which the unit was purchased.

SYMPTOM	POSSIBLE CAUSE	PROBABLE SOLUTION
Printer Dead	No AC power Fuse blown	Check Power Cord Replace fuse
Power on but printer not printing	Printer not ON LINE	Press ON LINE switch
Printer won't go ON LINE	Out of Paper; front cover open	Replace paper; close cover
Paper out sensor inoperative	Selector switch in "F"; SW1-8 ON	Normal condition; Set SW1-8 OFF
Paper slips around platen	Paper feed selector in "T" position	Set selector "F"
Head moves but does not print	Ribbon not installed correctly	Re-insert ribbon
Paper bunches up around platen paper wrinkles when using tractor feed	No reverse tension on paper. Selector switch is in "F" position.	Set paper supply lower than printer. Set selector to "T"
Cannot change form length	Cut sheet feeder switch SW2-3 is ON	Set SW2-3 OFF
Printout double-spaced	Auto line feed switch ON	Set DIP switch SW1-3 as required
Cannot print ASCII characters with code above 127	7 bit/8 bit switch set incorrectly	Set DIP switch SW3-8 as required
Wrong character set printed	Wrong character set selected	Set DIP switch SW1-5, SW1-6, SW1-7 as required
Cannot change print mode from computer	FONT and PITCH selector switches set incorrectly	Normal condition Refer to Section 3.1

Table 10.1 Troubleshooting

APPENDIX A

LQ-1500 Mode Character Set

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL		SP	0	@	P	`	p			SP	0	@	P	`	p
1		DC1	!	1	A	Q	a	q		DC1	!	1	A	Q	a	q
2		DC2	"	2	B	R	b	r		DC2	"	2	B	R	b	r
3		DC3	#	3	C	S	c	s		DC3	#	3	C	S	c	s
4		DC4	$	4	D	T	d	t		DC4	$	4	D	T	d	t
5			%	5	E	U	e	u			%	5	E	U	e	u
6			&	6	F	V	f	v			&	6	F	V	f	v
7	BEL		'	7	G	W	g	w	BEL		'	7	G	W	g	w
8	BS	CAN	(	8	H	X	h	x	BS	CAN	(	8	H	X	h	x
9	HT		)	9	I	Y	i	y	HT		)	9	I	Y	i	y
A	LF		*	:	J	Z	j	z	LF		*	:	J	Z	j	z
B	VT	ESC	+	;	K	[	k	{	VT	ESC	+	;	K	[	k	{
C	FF		,	<	L	\	l	¦	FF		,	<	L	\	l	¦
D	CR		−	=	M	]	m	}	CR		−	=	M	]	m	}
E	SO		.	>	N	^	n	~	SO		.	>	N	^	n	~
F	SI		/	?	O	_	o	DEL	SI		/	?	O	_	o	DEL

IBM Character Set 1 (LQ-1500/IBM Proprinter Mode)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL		SP	0	@	P	`	p			á	░	└	╨	α	≡
1		DC1	!	1	A	Q	a	q		DC1	í	▒	┴	╤	β	±
2		DC2	"	2	B	R	b	r		DC2	ó	▓	┬	╥	Γ	≥
3		DC3	#	3	C	S	c	s		DC3	ú	│	├	╙	π	≤
4		DC4	$	4	D	T	d	t		DC4	ñ	┤	─	╘	Σ	⌠
5			%	5	E	U	e	u			Ñ	╡	┼	╒	σ	⌡
6			&	6	F	V	f	v			ª	╢	╞	╓	μ	÷
7	BEL		'	7	G	W	g	w	BEL		º	╖	╟	╫	τ	≈
8	BS	CAN	(	8	H	X	h	x	BS	CAN	¿	╕	╚	╪	Φ	°
9	HT		)	9	I	Y	i	y	HT		⌐	╣	╔	┘	θ	●
A	LF		*	:	J	Z	j	z	LF		¬	║	╩	┌	Ω	•
B	VT	ESC	+	;	K	[	k	{	VT	ESC	½	╗	╦	█	δ	√
C	FF		,	<	L	\	l	¦	FF		¼	╝	╠	▄	∞	ⁿ
D	CR		–	=	M	]	m	}	CR		¡	╜	═	▌	ø	²
E	SO		.	>	N	^	n	~	SO		<<	╛	╬	▐	ε	■
F	SI		/	?	O	_	o		SI		>>	┐	╧	▀	∩	SP

DC3: LQ-1500 only

IBM Character Set 2 (LQ-1500/IBM Proprinter Mode)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL		SP	0	@	P	`	p	Ç	É	á	░	└	╨	α	≡
1		DC1	!	1	A	Q	a	q	ü	æ	í	▒	┴	╤	β	±
2		DC2	"	2	B	R	b	r	é	Æ	ó	▓	┬	╥	Γ	≥
3	♥	DC3	#	3	C	S	c	s	â	ô	ú	│	├	╙	π	≤
4	♦	DC4	$	4	D	T	d	t	ä	ö	ñ	┤	─	╘	Σ	⌠
5	♣	§	%	5	E	U	e	u	à	ò	Ñ	╡	┼	╒	σ	⌡
6	♠		&	6	F	V	f	v	å	û	ª	╢	╞	╓	µ	÷
7	BEL		'	7	G	W	g	w	ç	ù	º	╖	╟	╫	τ	≈
8	BS	CAN	(	8	H	X	h	x	ê	ÿ	¿	╕	╚	╪	Φ	°
9	HT		)	9	I	Y	i	y	ë	Ö	⌐	╣	╔	┘	θ	•
A	LF		*	:	J	Z	j	z	è	Ü	¬	║	╩	┌	Ω	·
B	VT	ESC	+	;	K	[	k	{	ï	¢	½	╗	╦	█	δ	√
C	FF		,	<	L	\	l	¦	î	£	¼	╝	╠	▄	∞	ⁿ
D	CR		-	=	M	]	m	}	ì	¥	¡	╜	═	▌	ø	²
E	SO		.	>	N	^	n	~	Ä	Pt	<<	╛	╬	▐	ε	■
F	SI		/	?	O	_	o		Å	ƒ	>>	┐	╧	▀	∩	SP

DC3: LQ-1500 only

IBM All Character Chart (IBM Proprinter Mode)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	SP	SP	SP	0	@	P	‘	p	Ç	É	á	░	└	╨	α	≡
1	SP	SP	!	1	A	Q	a	q	ü	æ	í	▒	┴	╤	β	±
2	SP	SP	″	2	B	R	b	r	é	Æ	ó	▓	┬	╥	Γ	≥
3	♥	SP	#	3	C	S	c	s	â	ô	ú	│	├	╙	π	≤
4	♦	¶	$	4	D	T	d	t	ä	ö	ñ	┤	─	╘	Σ	⌠
5	♣	§	%	5	E	U	e	u	à	ò	Ñ	╡	┼	╒	σ	⌡
6	♠	SP	&	6	F	V	f	v	å	û	ª	╢	╞	╓	µ	÷
7	SP	SP	'	7	G	W	g	w	ç	ù	º	╖	╟	╫	τ	≈
8	SP	SP	(	8	H	X	h	x	ê	ÿ	¿	╕	╚	╪	Φ	°
9	SP	SP	)	9	I	Y	i	y	ë	Ö	⌐	╣	╔	┘	θ	●
A	SP	→	*	:	J	Z	j	z	è	Ü	¬	║	╩	┌	Ω	•
B	SP	←	+	;	K	[	k	{	ï	¢	½	╗	╦	█	δ	√
C	SP	SP	,	<	L	\	l	¦	î	£	¼	╝	╠	▄	∞	^{n}
D	SP	SP	-	=	M	]	m	}	ì	¥	¡	╜	═	▌	ø	^{2}
E	SP	SP	.	>	N	^	n	~	Ä	Pt	<<	╛	╬	▐	ε	■
F	SP	0	/	?	O	_	o	SP	Å	ƒ	>>	┐	╧	▀	∩	SP

Diablo 630 Mode Character Set

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL		SP	0	@	P	‘	p			SP	0	@	P	‘	p
1		DC1	!	1	A	Q	a	q		DC1	!	1	A	Q	a	q
2			"	2	B	R	b	r			"	2	B	R	b	r
3			#	3	C	S	c	s			#	3	C	S	c	s
4		DC4	$	4	D	T	d	t		DC4	$	4	D	T	d	t
5			%	5	E	U	e	u			%	5	E	U	e	u
6			&	6	F	V	f	v			&	6	F	V	f	v
7	BEL		’	7	G	W	g	w	BEL		’	7	G	W	g	w
8	BS		(	8	H	X	h	x	BS		(	8	H	X	h	x
9	HT		)	9	I	Y	i	y	HT		)	9	I	Y	i	y
A	LF	SUB	*	:	J	Z	j	z	LF	SUB	*	:	J	Z	j	z
B	VT	ESC	+	;	K	[	k	{	VT	ESC	+	;	K	[	k	{
C	FF		,	<	L	\	l	¦	FF		,	<	L	\	l	¦
D	CR		–	=	M	]	m	}	CR		–	=	M	]	m	}
E	SO	RS	.	>	N	^	n	~	SO	RS	.	>	N	^	n	~
F		US	/	?	O	_	o	DEL		US	/	?	O	_	o	

International Character Set

	n	35_D 23_H	36_D 24_H	64_D 40_H	91_D $5B_H$	92_D $5C_H$	93_D $5D_H$	94_D $5E_H$	96_D 60_H	123_D $7B_H$	124_D $7C_H$	125_D $7D_H$	126_D $7E_H$
USA	0	#	$	@	[	\	]	^	'	{	¦	}	~
FRANCE	1	#	$	à	°	ç	§	^	'	é	ù	è	¨
GERMANY	2	#	$	§	Ä	Ö	Ü	^	'	ä	ö	ü	ß
ENGLAND	3	£	$	@	[	\	]	^	'	{	¦	}	~
DENMARK I	4	#	$	@	Æ	Ø	Å	^	'	æ	ø	å	~
SWEDEN	5	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
ITALY	6	#	$	@	°	\	é	^	ù	à	ò	è	ì
SPAIN	7	Pt	$	@	¡	Ñ	¿	^	'	¨	ñ	}	~
*JAPAN	8	#	$	@	[	¥	]	^	'	{	¦	}	~
*NORWAY	9	#	¤	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
*DENMARK II	10	#	$	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü

*Accessible only through software

APPENDIX B

Proportional Spacing Tables

ASCII Characters

Normal Characters

ASCII code	Char.	Width	ASCII code	Char.	Width
0	à	30	64	@	30
1	è	30	65	A	36
2	ù	36	66	B	36
3	ò	30	67	C	36
4	ì	30	68	D	36
5	°	30	69	E	36
6	£	36	70	F	36
7	¡	30	71	G	36
8	¿	30	72	H	36
9	Ñ	36	73	I	24
10	ñ	36	74	J	36
11	¤	36	75	K	36
12	Pt	42	76	L	36
13	Å	36	77	M	42
14	å	30	78	N	36
15	ç	30	79	O	36
16	§	30	80	P	36
17	ß	36	81	Q	36
18	Æ	42	82	R	36
19	æ	36	83	S	36
20	Ø	36	84	T	36
21	ø	30	85	U	42
22	¨	30	86	V	36
23	Ä	36	87	W	42
24	Ö	36	88	X	36
25	Ü	42	89	Y	36
26	ä	30	90	Z	30
27	ö	30	91	[	24
28	ü	36	92	\	30
29	É	36	93	]	24
30	é	30	94	^	30
31	¥	36	95	_	36
32	SPACE	30	96	'	18
33	!	18	97	a	30
34	"	30	98	b	36
35	#	30	99	c	30
36	$	30	100	d	36
37	%	36	101	e	30
38	&	36	102	f	30
39	'	18	103	g	36
40	(	24	104	h	36
41	)	24	105	i	30
42	*	30	106	j	30
43	+	30	107	k	36
44	,	18	108	l	30
45	–	30	109	m	42
46	.	18	110	n	36
47	/	30	111	o	30
48	0	30	112	p	36
49	1	30	113	q	36
50	2	30	114	r	30
51	3	30	115	s	30
52	4	30	116	t	30
53	5	30	117	u	36
54	6	30	118	v	36
55	7	30	119	w	42
56	8	30	120	x	30
57	9	30	121	y	36
58	:	18	122	z	30
59	;	18	123	{	24
60	<	30	124	¦	18
61	=	30	125	}	24
62	>	30	126	~	30
63	?	30	127	0	30

Italic Characters

ASCII code	Char.	Width	ASCII code	Char.	Width
128	à	30	192	@	30
129	è	30	193	A	36
130	ù	36	194	B	36
131	ò	30	195	C	36
132	ì	30	196	D	36
133	°	30	197	E	36
134	£	36	198	F	36
135	¡	30	199	G	36
136	¿	30	200	H	36
137	Ñ	36	201	I	24
138	ñ	36	202	J	36
139	¤	36	203	K	36
140	Pt	42	204	L	36
141	Å	36	205	M	42
142	å	30	206	N	36
143	ç	30	207	O	36
144	§	30	208	P	36
145	ß	36	209	Q	36
146	Æ	42	210	R	36
147	æ	36	211	S	36
148	Ø	36	212	T	36
149	ø	30	213	U	42
150	¨	30	214	V	36
151	Ä	36	215	W	42
152	Ö	36	216	X	36
153	Ü	42	217	Y	36
154	ä	30	218	Z	30
155	ö	30	219	[	24
156	ü	36	220	\	30
157	É	36	221	]	24
158	é	30	222	^	30
159	¥	36	223	_	36
160	SPACE	30	224	'	18
161	!	18	225	a	30
162	"	30	226	b	36
163	#	30	227	c	30
164	$	30	228	d	36
165	%	36	229	e	30
166	&	36	230	f	30
167	'	18	231	g	36
168	(	24	232	h	36
169	)	24	233	i	30
170	*	30	234	j	30
171	+	30	235	k	36
172	,	18	236	l	30
173	–	30	237	m	42
174	.	18	238	n	36
175	/	30	239	o	30
176	0	30	240	p	36
177	1	30	241	q	36
178	2	30	242	r	30
179	3	30	243	s	30
180	4	30	244	t	30
181	5	30	245	u	36
182	6	30	246	v	36
183	7	30	247	w	42
184	8	30	248	x	30
185	9	30	249	y	36
186	:	18	250	z	30
187	;	18	251	{	24
188	<	30	252	¦	18
189	=	30	253	}	24
190	>	30	254	~	30
191	?	30	255	0	30

Unit: 1/360 inch (0.07 mm)

IBM Graphics Characters

ASCII code	Char.	Width
3	♥	36
4	♦	36
5	♣	36
6	♠	36
20	¶	36
21	§	30
26	→	30
27	←	30
31	0	30
128	Ç	36
129	ü	36
130	é	30
131	â	30
132	ä	30
133	à	30
134	å	30
135	ç	30
136	ê	30
137	ë	30
138	è	30
139	ï	30
140	î	30
141	ì	30
142	Ä	36
143	Å	36
144	É	36
145	æ	36
146	Æ	42
147	ô	30
148	ö	30
149	ò	30
150	û	36
151	ù	36
152	ÿ	36
153	Ö	36
154	Ü	42
155	¢	30
156	£	36
157	¥	36
158	Pt	42
159	ƒ	30
160	á	30
161	í	30
162	ó	30
163	ú	36
164	ñ	36
165	Ñ	36
166	ª	30
167	º	30
168	¿	36
169	⌐	30
170	¬	30
171	½	30
172	¼	30
173	i	30
174	<<	36
175	>>	36
224	α	36
225	β	30
226	Γ	30
227	π	36
228	Σ	36

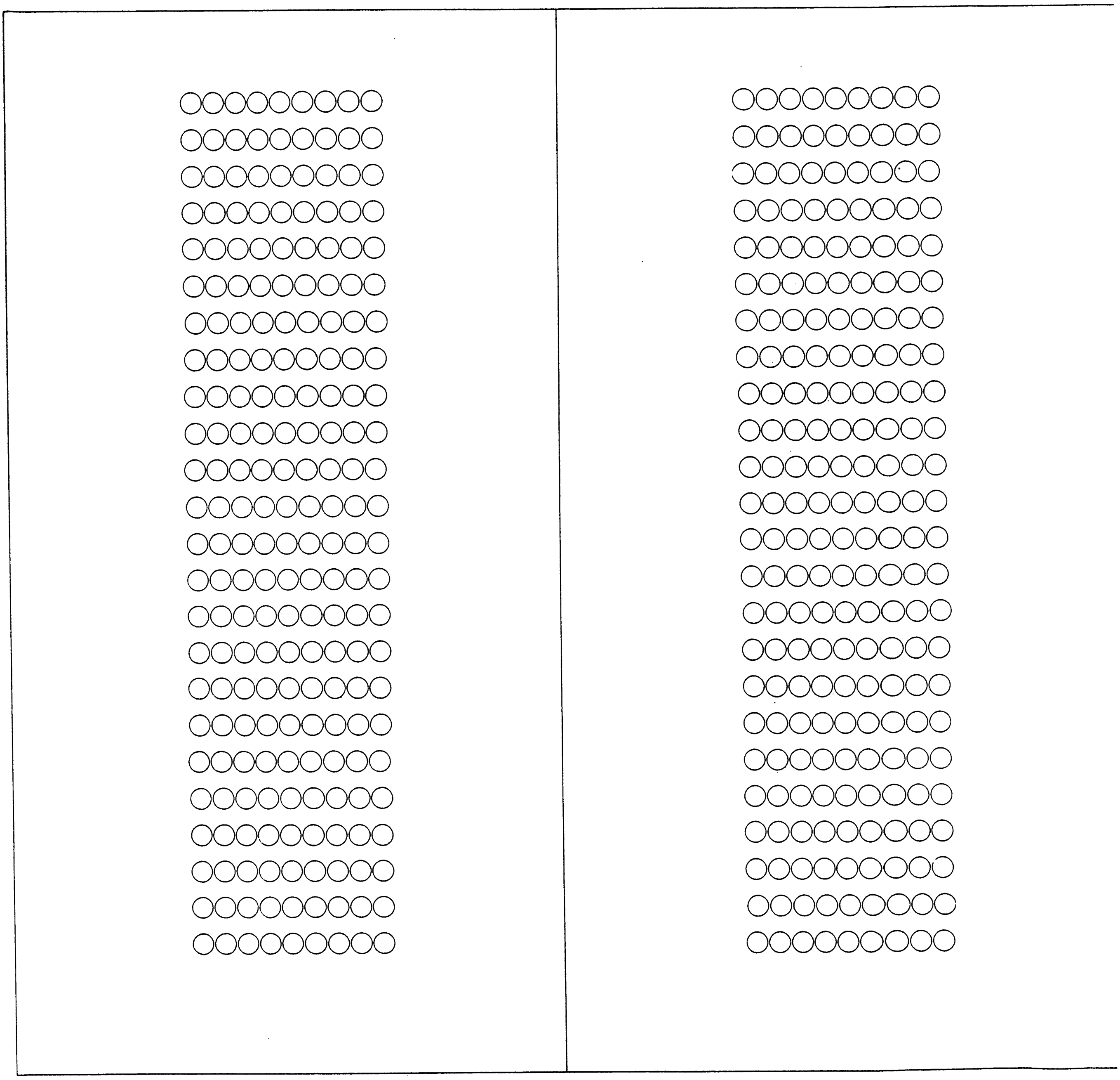
ASCII code	Char.	Width
229	σ	30
230	μ	36
231	τ	36
232	Φ	30
233	θ	30
234	Ω	36
235	δ	30
236	∞	36
237	φ	30
238	ε	30
239	∩	30
240	≡	30
241	±	30
242	≥	30
243	≤	30
246	÷	30
247	≈	36
248	°	30
249	●	24
250	•	18
251	√	42
252	ⁿ	24
253	²	24
254	■	24
255	SP	30

Unit: 1/360 inch (0.07 mm)

APPENDIX C

Down Line Load Character Matrix Blanks: Draft

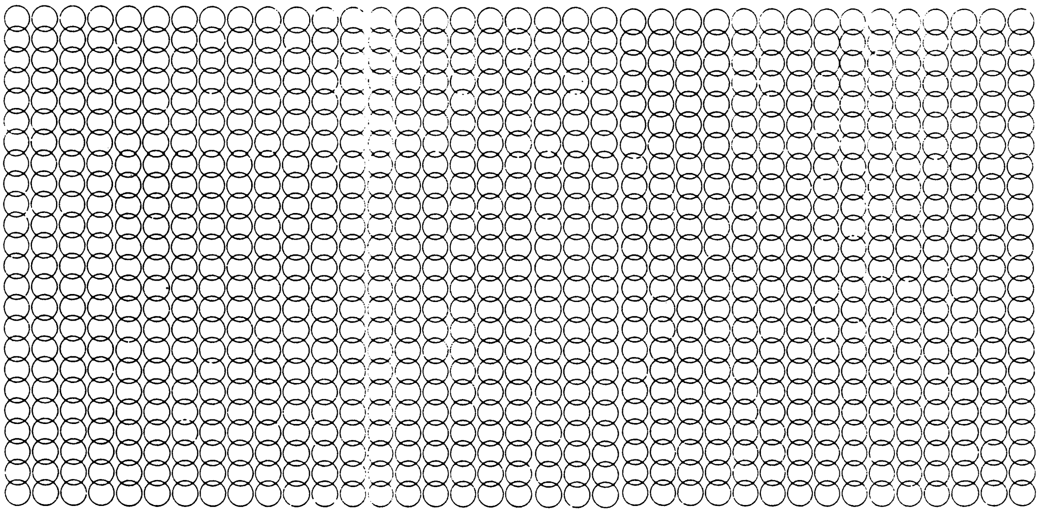
24×9

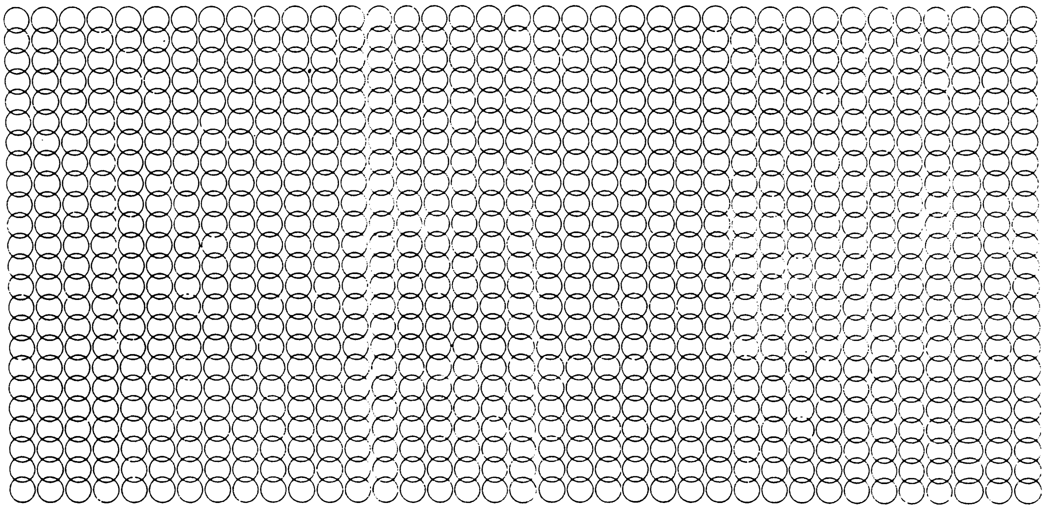


Make copies of this page first.
Then use blank matrices to design your down line load characters.

Down Line Load Character Matrix Blanks: LQ

24×37





Make copies of this page first.
Then use blank matrices to design your down line load characters.

APPENDIX D

Paper

1. Continuous paper

A list of the paper which may be used with this unit is provided below.
Width: 4~15.5 inches (102~394 mm) continuous paper with perforations on either side.

Quality and number of sheets: up to 4 sheets can be used; the relationship between the paper quality and number of sheets is given below.

Types of paper	Sheets	Thickness	
		(paper weight in pound)	(paper weight in g/m²)
Fine-quality paper	1	16~20	61~75
Non-carbon paper	2	11~14 (17) (17) is only for the last sheet.	41~53 (64) (64) is only for the last sheet.
	3		
	4		
Multi-layer paper with carbon	2		

- The multi-layer paper with carbon is such that the inserted carbon sheet is equivalent to a sheet of paper and so the maximum number of sheets of such paper is 2.

Note:
- The "paper weight in pound" represents the weight of the paper indicating the weight of 500 sheets [17×22 inches (432×559 mm)] in pound.

2. Single Sheet

Width: 4~16.5 inches (102~419 mm)
Height: 5~14.3 inches (127~363 mm)
Thickness (paper weight in pounds):
14~24 pounds (Only 1 sheet).
(paper weight in g/m²):
53~90 g/m² (Only 1 sheet)

- The printer will handle papers up to 0.013 inch (0.32 mm) thickness, providing they roll smoothly and easily around the platen. Multiple copies will be readable up to 4 copies of 14 lb. weight paper with chemical release paper.

- Paper should be within operating temperature and humidity range at least 24 hours prior to use.

3. Envelope

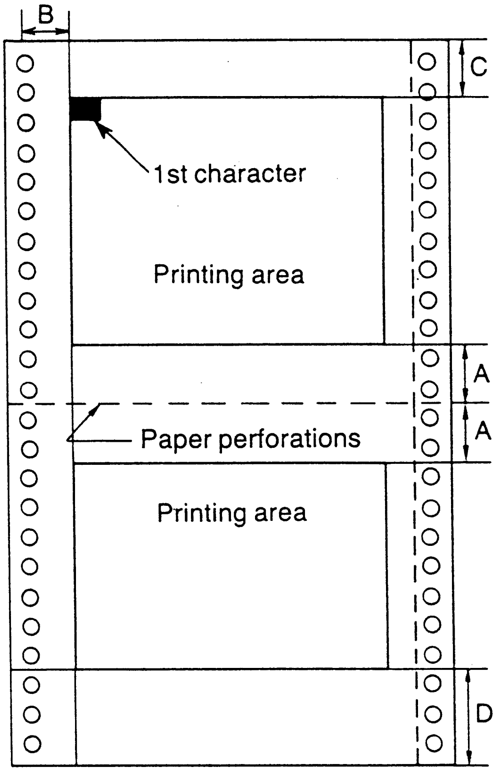
Standard Business Envelope
ie: #10 size

Note:
Since envelopes vary in size, paper weight, and construction we can not guarantee print quality and paper handling for all types of envelopes.

APPENDIX E

Printing Area

1. Continuous paper

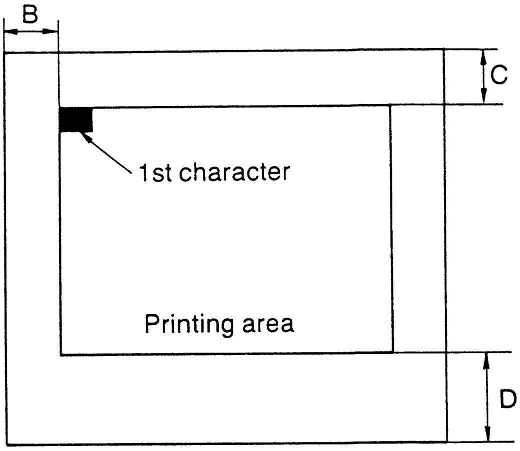

B
C
1st character
Printing area
A
Paper perforations
A
Printing area
D

A: 1 inch (25.4 mm)
B: 0.85 inches (21.6 mm)
C: 1 inch (25.4 mm)
D: 2.2 inches (55.9 mm)

Notes:

A: Value A indicates the positions near the paper perforations where the lines may slip.
B: Value B indicates the position where the first character is printed. (When the left tractor is set on the left end.)
C: Value C indicates the area from the top of the paper to the position where the first character is printed.
D: Value D indicates the position where no more paper (13 lines remaining) is detected.

2. Single Sheet

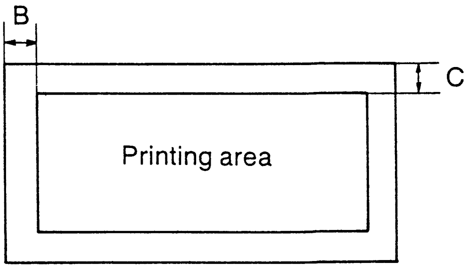

B
C
1st character
Printing area
D

B: 1.46 inches (37 mm)
C: 1 inch (25.4 mm)
D: 1 inch (25.4 mm)

Notes:

B: Value B indicates the position where the first character is printed. (When the paper is positioned to far left.)
C: Value C indicates the area from the top of the paper to the position where the first character is printed.
D: Value D indicates the position where the paper is released from engagement of the pinch rollers.

3. Envelope


B
C
Printing area

Notes:

B: 1 inch (25.4 mm)
C: 1 inch (25.4 mm)

TECHNICAL SUPPORT CALLS

If you have read this manual and tried the troubleshooting procedures and you are still having difficulty please contact the store from which the unit was purchased.

You may also call the end user technical support telephone number which is operational during east coast business hours (9:00 AM to 5:00 PM).

The end user technical support number is: 1-800-222-0584

OPTIONS & SUPPLIES

Please contact your local Panasonic printer dealer for availability.

KX-P22	Bottom Feed Tractor
KX-P35	Automatic Sheet Feeder
KX-P43	32 K Buffer Chip
KX-P60	Font Card (Bold PS)
KX-P61	Font Card (Roman)
KX-P62	Font Card (Prestige)
KX-P63	Font Card (Gothic)
KX-P64	Font Card (San Serif)
KX-P65	Font Card (Orator)
KX-P66	Font Card (Script)
KX-P140	Ribbon Cassette (Black)